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**GOEWERMENSKENNISGEWING**

**DEPARTEMENT VAN VERVOER**

No. R. 377 18 Maart 1977

**DIE EKSAMENREGULASIES VIR  
 INGENIEUROFFISIERS, 1977**

Die Minister van Vervoer het, kragtens artikel 356 (1) van die Handelskeepvaartwet, 1951 (Wet 57 van 1951), soos gewysig, die Eksamenregulasies vir Ingenieur-offisiere, 1968, soos afgekondig by Goewermenskennisgewing R. 471 van 22 Maart 1968, en later gewysig\*, herroep en kragtens genoemde artikel die regulasies in die Bylae hiervan uitgevaardig.

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11. Wangedrag van kandidate.

\* By Goewermenskennisgewings R. 1286 van 14 Augustus 1970 en R. 755 van 18 April 1975.

**GOVERNMENT NOTICE**

**DEPARTMENT OF TRANSPORT**

No. R. 377 18 March 1977

**THE EXAMINATION REGULATIONS  
 FOR ENGINEER-OFFICERS, 1977**

The Minister of Transport has, in terms of section 356 (1) of the Merchant Shipping Act, 1951 (Act 57 of 1951), as amended, repealed the Examination Regulations for Engineer-Officers, 1968, promulgated by Government Notice R. 471, dated 22 March 1968, and subsequently amended\*, and has in terms of the said section, made the regulations contained in the Schedule hereto.

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\* By Government Notices R. 1286 of 14 August 1970 and R. 755 of 18 April 1975.

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**A. KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS TWEDE INGENIEUROFFISIER (KUSVAART) EN ENDOSSEMENT**

12. Ouderdom van kandidaat.

**(1) Werkwinkeldiens**

13. Diens as leerlingingenieur of ambagsgesel.

14. Studente- of tegniese vakleerlingskappe.

15. Voltydse of stapelkursusse aan tegniese skole, tegniese kolleges of universiteite.

16. Vergoedende diens.

**(2) Seediens**

17. Tydperk seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart).

18. Tydperk seediens vereis vir die endossering van 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart).

19. Tipe seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) en endossement.

20. Kwytstelling van seediens vir 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart).

**B. KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS HOOF-INGENIEUROFFISIER (KUSVAART) EN ENDOSSEMENT**

21. Tydperk seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart).

22. Tydperk seediens vereis vir die endossering van 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart).

23. Tipe seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) en endossement.

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25. Eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) sonder dat 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) voorgelê word.

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**A. KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS TWEDE INGENIEUROFFISIER (VREEMDE VAART) EN ENDOSSEMENT**

26. Ouderdom van kandidaat.

**(1) Werkwindeldiens**

27. Diens as leerlingingenieur of ambagsgesel.

28. Studente- of tegniese vakleerlingskappe.

29. Voltydse of stapelkursusse aan tegniese skole, tegniese kolleges of universiteite.

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**A. CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS SECOND ENGINEER-OFFICER (COASTING) AND ENDORSEMENT**

12. Age of candidate.

**(1) Workshop service**

13. Service as apprentice engineer or journeyman.

14. Student or technical apprenticeships.

15. Full-time or sandwich courses at technical school, technical college or university.

16. Compensatory service.

**(2) Sea service**

17. Period of sea service required of a candidate for a certificate of competency as Second Engineer-Officer (Coasting).

18. Period of sea service required for the endorsement of a certificate of competency as Second Engineer-Officer (Coasting).

19. Type of sea service required of a candidate for a certificate of competency as Second Engineer-Officer (Coasting) and endorsement.

20. Remission of sea service for a candidate for a certificate of competency as Second Engineer-Officer (Coasting).

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**A. CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS SECOND ENGINEER-OFFICER (FOREIGN-GOING) AND ENDORSEMENT**

26. Age of candidate.

**(1) Workshop service**

27. Service as apprentice engineer or journeyman.

28. Student or technical apprenticeship.

29. Full-time or sandwich courses at technical school, technical college or university.

30. Engineer-Officer Cadet Training Course.

31. Compensatory service.

**(2) Seediens**

32. Tydperk seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart).

33. Tydperk seediens vereis vir die endossering van 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart).

34. Tipe seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) en endossement.

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### **B. KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS HOOF-INGENIEUROFFISIER (VREEMDE VAART) EN ENDOSSEMENT**

36. Tydperk seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart).

37. Tydperk seediens vereis vir die endossering van 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart).

38. Tipe seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) en endossement.

39. Kwytskelding van seediens vir 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart).

40. Eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) sonder dat 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) voorgelê word.

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**(2) Sea service**

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33. Period of sea service required for the endorsement of a certificate of competency as Second Engineer-Officer (Foreign-going).

34. Type of sea service required of a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) and endorsement.

35. Remission of sea service for a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going).

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53. Eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart).

54. Eksamen vir endossering van 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) of Hoof-ingenieur-offisier (Vreemde Vaart).

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## HOOFSTUK I

### ALGEMEEN

#### *Titel van hierdie regulasies*

1. Hierdie regulasies heet die Eksamenregulasies vir Ingenieur-offisiere, 1977.

#### *Vertolking*

2. In hierdie regulasies beteken die uitdrukking “die Wet” die Handelskeepsvaartwet, 1951 (Wet 57 van 1951) soos gewysig, en tensy die samehang anders aandui, het enige uitdrukking wat in hierdie regulasies gebruik word en waaraan in die Wet ’n betekenis geheg is, die betekenis aldus daaraan geheg en beteken—

“goedgekeur” deur die Sekretaris goedgekeur;

“Hoof-ingenieur-offisier (Kusvaart)” ’n Hoof-ingenieur-offisier van ’n kusvaarder;

“Hoof-ingenieur-offisier (Vreemde Vaart)” ’n Hoof-ingenieur-offisier van ’n skip of vreemde vaart;

“dagwerk” ingenieurswerk op ’n skip gedoen deur ’n ingenieur-offisier wat as lid van die bemanning in diens is, uitgesonderd ingenieurswerk op gereelde waghoudiens;

“eksaminator” die persoon wat kragtens artikel 77 (4) van die Wet as sodanig aangestel is;

“kW” kilowatt;

“lang seereis” ’n seereis waarin die uiterste hawens wat die skip in die loop van die seereis besoek, minstens 500 myl uit mekaar is;

“myl” 1852 meter;

“drywing” onder meer—

(a) waar suierstoommasjiene gebruik word, indika-terdrywing;

(b) waar motorenjins gebruik word, remdrywing; en

(c) waar stoomturbines gebruik word, as-drywing.

“seediens” ook diens op modderskuite, baggerskepe, vissersbote, loodsbote of sleepbote wat in ’n hawe gebruik word;

“Tweede Ingenieur-offisier (Kusvaart)” ’n Tweede Ingenieur-offisier van ’n kusvaarder;

“Tweede Ingenieur-offisier (Vreemde Vaart)” ’n Tweede Ingenieur-offisier van ’n skip op vreemde vaart; en

“kort seereis” ’n seereis waarin die uiterste hawens wat die skip in die loop van die seereis besoek, minder as 500 myl uit mekaar is.

#### *Oorweging van twyfelagtige gevalle*

3. In die geval van onsekerheid oor die aanvaarbaarheid van ’n kandidaat se diens- of ander kwalifikasies vir ’n bekwaamheidsertifikaat of oor sy toelating tot ’n eksamen vir sodanige sertifikaat moet die saak na die Sekretaris vir beslissing verwys word.

#### *Plekke waar eksamens afgeneem word*

4. Eksamens vir bekwaamheidsertifikate moet in Kaapstad en Durban afgeneem word op tydstippe wat by die bevoegde beampte vasgestel kan word: Met dien verstande dat van tyd tot tyd spesiale reëlins getref kan word om eksamens elders as in Kaapstad en Durban af te neem.

#### *Aansoekvorm*

5. ’n Eksamenkandidaat vir ’n bekwaamheidsertifikaat moet op die vorm goedgekeur deur die Sekretaris aansoek doen,

*Annex 3.*—Syllabuses for examinations of Second Engineer-Officer (Foreign-going) and Chief Engineer-Officer (Foreign-going).

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## CHAPTER I

### GENERAL

#### *Title of these regulations*

1. These regulations are called the Examination Regulations for Engineer-Officers, 1977.

#### *Interpretation*

2. In these regulations the expression “the Act” means the Merchant Shipping Act, 1951 (Act 57 of 1951), as amended, and unless the context otherwise indicates, any expression used in these regulations to which a meaning has been assigned in the Act, bears the meaning so assigned, and—

“approved” means approved by the Secretary;

“Chief Engineer-Officer (Coasting)” means a Chief Engineer-Officer of a coasting ship;

“Chief Engineer-Officer (Foreign-going)” means a Chief Engineer-Officer of a foreign-going ship;

“day-work” means engineering work, other than on regular watch, performed in a ship by an engineer-officer employed as a member of the crew;

“examiner” means the person appointed as such in terms of section 77 (4) of the Act;

“kW” means kilowatts;

“long voyage” means a voyage in which the distance between the extreme ports visited by the ship in the course of a voyage is not less than 500 miles;

“mile” means 1852 metres;

“power” includes—

(a) where reciprocating steam engines are employed, indicated power;

(b) where motor engines are employed, brake power; and

(c) where steam turbines are employed, shaft power.

“sea service” includes service in hoppers, dredgers, fishing vessels, pilot vessels or tugs operating in port;

“Second Engineer-Officer (Coasting)” means a Second Engineer-Officer of a coasting ship;

“Second Engineer-Officer (Foreign-going)” means a Second Engineer-Officer of a foreign-going ship; and

“short voyage” means a voyage in which the distance between the extreme ports visited by the ship in the course of the voyage is less than 500 miles.

#### *Consideration of doubtful cases*

3. If any doubt arises as to the acceptance of the service or other qualifications of any candidate for a certificate of competency or as to his admission to an examination for such a certificate, the matter shall be referred to the Secretary for decision.

#### *Places of examination*

4. Examinations for certificates of competency shall be held at Cape Town and Durban at such times as may be ascertained from the proper officer: Provided that special arrangements may be made from time to time for examinations to be held at places other than Cape Town and Durban.

#### *Form of application*

5. A candidate for examination for a certificate of competency shall apply on the form approved by the Secretary.

*Ander dokumente wat ingedien moet word*

6. (1) 'n Kandidaat vir 'n ander bekwaamheidsertifikaat as dié van Hoofingenieur-offisier—Spesiale Graad, moet seker maak dat die vorm vermeld in regulasie 5, vergesel van sy—

- (a) geboortesertifikaat of ander aanneemlike ouderdomsbewys;
- (b) vakleerlingsertifikaat of aanneemlike opleiding-skema;
- (c) ontslagsertifikaat, indien hy sulke sertifikaat het; en
- (d) getuigskrifte;

by die kantoor van die eksaminator by die hawe waar die kandidaat geëksamineer wil word, ingelewer word of geos word om genoemde eksaminator te bereik minstens 14 dae voor die datum waarop die kandidaat geëksamineer wil word, of dat vermelde dokumente by die kantoor van die bevoegde beampte by enige ander hawe ingelewer word of geos word sodat hulle sodanige bevoegde beampte bereik minstens 21 dae voor die datum van die eksamen: Met dien verstande dat die eksaminator die kandidaat kan toelaat om eksamen te doen al word vermelde dokumente ook later ingelewer of geos as wat by hierdie regulasie bepaal word.

(2) Indien 'n kandidaat in besit is van 'n geldige bekwaamheid- of dienssertifikaat, moet hy sodanige sertifikaat aan die eksaminator oorhandig alvorens hy toegelaat word om die eksamen te doen. As sodanige sertifikaat van 'n vreemde oorsprong is, word dit aan die kandidaat teruggegee.

*Getuigskrifte*

7. (1) Behoudens die bepalings van regulasie 11, moet 'n kandidaat vir 'n ander bekwaamheidsertifikaat as dié van Hoof-ingenieur-offisier—Spesiale Graad, getuigskrifte voorlê wat sy werkwinkeldiens en sy seediens dek.

(2) Elke getuigskrif moet gestel wees in een van die vorms uiteengesit in Aanhangsel 1 of in 'n ander vorm met wesenlik dieselfde strekking.

(3) Die getuigskrifte oor sy werkwinkeldiens moet van die kandidaat se gedrag en bekwaamheid melding maak en meld watter soort werk hy gedoen en die tydperk wat hy aan elke vertakking, bv. paswerk, oprigtingswerk, draaiwerk, masjienwerk, ens., bestee het. Hierdie getuigskrifte moet deur die werkgewer of sy verteenwoordiger geteken wees.

(4) Die getuigskrifte oor sy kwalifiserende seediens moet van die kandidaat se matigheid, ervaring, bekwaamheid en algemene goeie gedrag melding maak en moet meld wat sy werklike rang op waghoudiens is, hoeveel Ingenieur-offisiere gelyktydig by die ketels en/of die hoof-aandrywingsmasjinerie waghoudiens verrig en wat die aard is van die werk wat hy gedoen het. Hierdie getuigskrifte moet geteken word deur die Hoof-ingenieur-offisier onder wie die diens verrig is, en, indien moontlik, moet hulle ook geëndosseer word deur die Ingenieursuperintendent of, waar daar nie so 'n superintendent is nie, deur die gesagvoerder of die verteenwoordiger van die eienaar. Indien die kandidaat 'n Hoof-ingenieur-offisier is, moet die getuigskrifte deur die Ingenieursuperintendent of besturende eienaar of die sekretaris van die maatskappy onderteken word.

(5) Indien 'n kandidaat effens hardhorend is of aan 'n ander liggaamsgebrek ly wat van so 'n aard is dat dit die behoorlike vervulling van sy pligte as Ingenieur-offisier op waghoudiens kan belemmer, moet in sy getuigskrifte vermeld word of die gebrek inderdaad die behoorlike vervulling van die kandidaat se pligte op enige wyse belemmer het.

*Other documents to be submitted*

6. (1) A candidate for a certificate of competency, other than as Chief Engineer-Officer—Special Grade, shall ensure that the form mentioned in regulation 5 accompanied by his—

- (a) birth certificate, or other acceptable proof of age;
- (b) certificate of apprenticeship or acceptable training scheme;
- (c) certificates of discharge, if any; and
- (d) testimonials;

is handed in at the office of, or posted so as to reach, the examiner at the port at which the candidate wishes to be examined at least 14 days before the date on which he wishes to be examined, or is handed in at the office of, or posted so as to reach, the proper officer at any other port at least 21 days before the date of the examination: Provided that the examiner may allow the candidate to sit even if the said documents are handed in or posted later than is required by this regulation.

(2) If a candidate is in possession of a valid certificate of competency or service, he shall, before being admitted to the examination, hand in such certificate to the examiner. If such certificate is of foreign origin it will be returned to the candidate.

*Testimonials*

7. (1) Subject to the provisions of regulation 11, a candidate for a certificate of competency, other than Chief Engineer-Officer—Special Grade, shall produce testimonials covering his workshop service and his sea service.

(2) Each testimonial shall be in one of the forms set forth in Annex 1 or in some other form substantially to the like effect.

(3) The testimonials covering his workshop service shall testify to the candidate's conduct and ability, and state the kind of work on which he was engaged and the period of time spent in each branch, e.g. fitting, erecting, turning, machine work, etc. These testimonials shall be signed by the employer or his representative.

(4) The testimonials covering his qualifying sea service shall testify to the candidate's sobriety, experience, ability and general good conduct and state his actual rank on watch, the number of engineer-officers simultaneously on watch on the boilers and/or the main propelling machinery and the nature of the duties performed by him. These testimonials shall be signed by the Chief Engineer-Officer under whom the service has been performed and, if possible, they shall also be endorsed by the Engineer Superintendent or where there is no such Superintendent by the master or representative of the owner. Where the candidate is a Chief Engineer-Officer, the testimonials shall be signed by the Engineer Superintendent or managing owner or the secretary of the company.

(5) If a candidate is somewhat hard of hearing or suffers from any other physical defect of such a nature that it might interfere with the proper performance of his duties as an Engineer-Officer on watch, it shall be stated in his testimonials whether the defect did in fact interfere in any way with the proper performance of the candidate's duties.



*Doofheid en ander liggaams- of geestesgebreke*

8. (1) Indien die eksaminator in die loop van 'n eksamen vind dat 'n kandidaat doof is of 'n spraakgebrek het of aan die een of ander liggaamlike of geestelike swakheid ly en sodanige eksaminator daarvan oortuig is dat die mate van doofheid of gebrek of ander swakheid sodanig is dat dit die kandidaat onbekwaam maak vir die vervulling van die gewone pligte van die skeepsrang wat die sertifikaat waarvoor hy geëksamineer word, hom die reg sou gee om te beklee, moet hy die kandidaat, indien dié dit verlang, toelaat om die eksamen te voltooi en moet hy die saak aan die Sekretaris rapporteer met die oog op sodanige stappe as wat laasgenoemde nodig ag.

(2) Ondanks die bepalings van hierdie regulasies mag nóg 'n bekwaamheidsertifikaat, nóg 'n dokument wat die uitreiking van so 'n sertifikaat magtig aan 'n kandidaat wat in subregulasie (1) vermeld word en in die eksamen geslaag het, uitgereik word: Met dien verstande dat 'n bekwaamheidsertifikaat uitgereik kan word aan 'n kandidaat wat, nadat hy in die eksamen geslaag het, aan die Sekretaris bevredigende bewys lewer dat sy gehoor, spraak of liggaamlike of geestelike toestand verbeter het of normaal is.

*Diens onvoldoende bevind*

9. (1) Indien 'n kandidaat in die eksamen geslaag het en daarna ontdek word dat sy diens onvoldoende is om hom geregtig te maak tot die ontvangs van 'n bekwaamheidsertifikaat van die graad waarvoor hy geslaag het, mag die sertifikaat behoudens die bepalings van hierdie regulasie nie aan hom toegeken word nie.

(2) Indien die Sekretaris nie daarvan oortuig is dat die fout in die berekening van die kandidaat se diens deur die fout van of deur opsetlike wanvoorstelling deur die kandidaat veroorsaak is nie, moet die sertifikaat teruggehou word tot tyd en wyl bevredigende bewys gelewer is dat al die nodige diens voltooi is, en daarna moet die sertifikaat behoudens die bepalings van hierdie regulasies aan die kandidaat uitgereik word.

(3) As die Sekretaris daarvan oortuig is dat die fout opsetlik gemaak is, moet die sertifikaat teruggehou word tot tyd en wyl die kandidaat al die nodige kwalifiserende diens en ook sodanige verdere diens as wat die Sekretaris bepaal, voltooi, weer die toepaslike bedrag betaal en weer die eksamen deurgekom het.

(4) Addisionele diens wat ooreenkomstig subregulasie (3) deur 'n kandidaat gelewer is, geld nie as kwalifiserende diens vir 'n ander sertifikaat nie.

*Afskrifte van verlore sertifikate*

10. 'n Applikant vir 'n gewaarmerkte afskrif van 'n verlore sertifikaat, ongeag of dit 'n bekwaamheid- of 'n dienssertifikaat is, moet op die vorm goedgekeur deur die Sekretaris aansoek doen, en sodanige aansoek aan die bevoegde beampte oorhandig en terselfdertyd die bedrag van R2 betaal. Die applikant moet voor die bevoegde beampte 'n verklaring doen oor die omstandighede waarin die sertifikaat verlore is en sodanige beampte moet die aansoekvorm aan die Sekretaris deurstuur.

Geen betaling word gevorder as die applikant bewys lewer dat die sertifikaat as gevolg van skipbreuk of 'n brand aan boord verlore is nie.

*Wangedrag van kandidate*

11. (1) In die geval van 'n kandidaat wat—

(a) na ondertekening van die ooreenkoms met die bemanning nagelaat het om hom by sy skip aan te meld;

(b) van sy skip gedros het nadat hy hom daar aangemeld het;

*Deafness and other physical or mental disabilities*

8. (1) If during the progress of an examination the examiner finds that a candidate is deaf, or has an impediment in his speech, or suffers from some other physical or mental infirmity and is satisfied that the degree of deafness or the impediment or other infirmity is such as to render the candidate incompetent to discharge the ordinary duties of the station on the ship which the certificate for which the candidate is being examined would entitle him to hold, he shall if the candidate so desires, allow him to complete the examination and shall report the matter to the Secretary for such action as he may deem necessary.

(2) Notwithstanding the provisions of these regulations, neither a certificate of competency nor a document authorising the delivery of such a certificate shall be issued to a candidate referred to in subregulation (1) who has passed the examination: Provided that a certificate of competency may be issued to a candidate who, after having passed the examination, produces satisfactory evidence to the Secretary to the effect that his hearing, speech or physical or mental condition has improved or is normal.

*Service found to be insufficient*

9. (1) If, after a candidate has passed the examination, it is discovered that his service is insufficient to entitle him to receive a certificate of competency of the grade for which he has passed, the certificate shall not, subject to the provisions of this regulation, be granted to him.

(2) If the Secretary is not satisfied that the error in the calculation of the candidate's service occurred through the fault of or through wilful misrepresentation by the candidate, the certificate shall be withheld pending the production of satisfactory proof that the necessary service has been completed in full, upon which the certificate shall, subject to the provisions of these regulations, be issued to him.

(3) If the Secretary is satisfied that the error was deliberately made, the certificate shall be withheld until the candidate has completed the necessary qualifying service in full and has performed such further period of service as may be decided by the Secretary, has again paid the appropriate fee and has again passed the examination.

(4) Any additional service performed by the candidate in terms of subregulation (3) shall not count as qualifying service for any other certificate.

*Copies of lost certificates*

10. An applicant for a certified copy of a lost certificate, whether of competency or service, shall apply on the form approved by the Secretary, and shall hand it to the proper officer, paying at the same time the fee of R2. A declaration as to the circumstances in which the certificate was lost shall be made by the applicant before the proper officer, who shall transmit the form of application to the Secretary.

No fee is chargeable if the applicant shows that the certificate was lost through shipwreck or fire on board ship.

*Misconduct by candidates*

11. (1) In the case of a candidate who—

(a) after having signed the agreement with the crew, has neglected to join his ship;

(b) after having joined, has deserted his ship;



(c) deur 'n wettige regsprekende liggaam skuldig bevind is aan 'n misdryf waarvoor hy tot gevangenisstraf sonder boete as keuse gevonnissen is of wat na die oordeel van die eksaminator van 'n ernstige aard is; of

(d) skuldig bevind is aan 'n misdryf ten opsigte waarvan ooreenkomstig artikel 183 (b) van die Wet 'n inskrywing in die amptelike skeepsjoernaal aangebring en wat na die mening van die eksaminator van 'n ernstige aard is;

moet die getuigskrifte wat by regulasie 7 (4) vereis word, die tydperk van twee jaar na sodanige wangedrag dek: Met dien verstande dat die Sekretaris die tydperk na eie oordeel op versoek van die kandidaat kan verkort nadat hy die saak ondersoek het.

(2) Indien ooit aan die Sekretaris gerapporteer word dat 'n kandidaat 'n eksaminator of iemand anders wat kragtens die Wet werksaam is, 'n som geld of iets anders hoegenaamd aangebied het met die doel om hom op enige wyse met betrekking tot 'n eksamen te beïnvloed, moet die Sekretaris die saak ondersoek en indien hy daarvan oortuig is dat die kandidaat so 'n aanbod vir vermelde doel gedoen het, kan hy weier om toe te laat dat die kandidaat geëksamineer word of, indien die eksamen reeds begin het, kan hy die eksaminator gelas om nie met die eksamen voort te gaan nie, of, indien die eksamen reeds voltooi is, kan hy die uitslag daarvan nietig verklaar, en hy kan die gelde wat deur die kandidaat betaal is, verbeurd verklaar en weier om toe te laat dat sodanige kandidaat hom binne 'n tydperk van hoogstens 12 maande met ingang van die datum waarop sodanige aanbod gedoen is, vir 'n eksamen in die Republiek aanmeld.

## HOOFSTUK II

KWALIFIKASIES VEREIS VAN 'N KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS TWEDE INGENIEUROFFISIER (KUSVAART) EN ENDOSSEMENT OF HOOF-INGENIEUROFFISIER (KUSVAART) EN ENDOSSEMENT

A. KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS TWEDE INGENIEUROFFISIER (KUSVAART) EN ENDOSSEMENT

### Ouderdom van kandidaat

12. 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) moet minstens 21 jaar oud wees.

#### (1) Werkwinkeldiens

##### *Diens as leerlingingenieur of ambagsgesel*

13. (1) 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) moet bewys dat hy sedert bereiking van die ouderdom van 15 jaar minstens vier jaar lank as 'n vakleerling of ambagsgesel bevredigende diens gelewer het in werk wat vir die opleiding van 'n tegnikus in die vervaardiging en onderhoud van masjinerie geskik is.

(2) Die tydperk van vier jaar werkwinkeldiens wat by subregulasie (1) vereis word, moet bestee gewees het—

(a) aan die montering, oprigting of herstel van masjinerie van geskikte grootte of beskrywing (bv. werk aan skeepsmasjiene en taamlike groot hulpmasjiene van 'n tipe wat in skepe geïnstalleer word, of aan aandrywingsmasjiene van dergelike waarde in die opleiding van skeepsingeniërs), hetsy in of buite die werkwinkel; of

(b) gedeeltelik aan die tipe werk genoem in paragraaf (a) en gedeeltelik of uitsluitlik aan ander geskikte werk, onderworpe daaraan dat tydsbesteding aan sekere gespesialiseerde tipes werk op die volgende grondslag geskied:

(c) has been convicted by a legal tribunal of an offence for which he has been sentenced to imprisonment without the option of a fine or which the examiner considers to be of a serious nature; or

(d) has been found guilty of an offence in respect of which an entry has been made in the official logbook in terms of section 183 (b) of the Act and which the examiner considers to be of a serious nature;

the testimonials required in terms of regulation 7 (4) shall cover the period of two years subsequent to such misconduct: Provided that upon application by the candidate the Secretary, after having investigated the matter, may in his discretion reduce the period.

(2) If at any time it is reported to the Secretary that a candidate has offered any sum of money or other thing whatsoever to any examiner or any other person employed under the Act for the purpose of influencing him in any manner in relation to an examination, the Secretary shall enquire into the matter, and if he is satisfied that the candidate has made such an offer for the said purpose, he may refuse to permit the candidate to be examined or, if the examination has already commenced, may direct the examiner not to proceed with the examination, or, if the examination has already been completed, may cancel the result thereof, and may order the forfeiture of any fee paid by the candidate, and may refuse to allow him to present himself at any examination in the Republic for a period not exceeding 12 months from the date of making such offer.

## CHAPTER II

QUALIFICATIONS REQUIRED OF A CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS SECOND ENGINEER-OFFICER (COASTING) AND ENDORSEMENT, OR CHIEF ENGINEER-OFFICER (COASTING) AND ENDORSEMENT

A. CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS SECOND ENGINEER-OFFICER (COASTING) AND ENDORSEMENT

### *Age of candidate*

12. A candidate for a certificate of competency as Second Engineer-Officer (Coasting) shall be not less than 21 years of age.

#### (1) Workshop service

##### *Service as apprentice engineer or journeyman*

13. (1) A candidate for a certificate of competency as Second Engineer-Officer (Coasting) shall prove that since reaching the age of 15 years he has served satisfactorily for not less than 4 years as an apprentice or journeyman on work suitable for the training of a technician in the manufacture and maintenance of machinery.

(2) The period of four years' workshop service required in terms of subregulation (1) shall have been spent—

(a) on the fitting, erecting or repairing of machinery of suitable size or description (e.g. work on marine engines and substantial auxiliary machinery of a type fitted in ships, or on motive power machinery which has a similar value in the training of marine engineers), either in the works or outside; or

(b) partly on the type of work specified in paragraph (a), and partly or entirely on other suitable work, subject to a time allowance for certain specialised types of work on the following basis:

|                                                                                                           |                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Herstel en onderhoud van swaardiensdieselmotors                                                           | Voltyds tot hoogstens 3 jaar.                                                                                             |
| Herstel en onderhoud van petrolmotors                                                                     | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Metaal draaiwerk                                                                                          | Voltyds tot hoogstens 2 jaar.                                                                                             |
| Geelkopafwerking                                                                                          | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Maak of herstel van ketels                                                                                | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Modelmakery                                                                                               | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Skaafwerk, gleufwerk, sterkarm-skaafwerk en freeswerk                                                     | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Gereedskapkamer                                                                                           | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Goedgekeurde skemas vir opleiding in die gebruik van handgereedskap en klein masjiengereedskap            | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Smidswerk                                                                                                 | Voltyds tot hoogstens 6 maande.                                                                                           |
| Kopersmidswerk                                                                                            | Voltyds tot hoogstens 6 maande.                                                                                           |
| Sweiswerk                                                                                                 | Voltyds tot hoogstens 6 maande.                                                                                           |
| Werk in tekenkantoor as tekenaar of ingenieur werksaam in verband met samestelling, detail of ontwerp     | Voltyds tot 1 jaar. Indien meer as 1 jaar in die tekenkantoor deurgebring is, tel net die helfte van die addisionele tyd. |
| Elektriese winkel of herstelwerk nie reeds hierbo gedek nie, uitgesonderd werk van minder belangrike aard | Voltyds tot 1 jaar, en daarbo tel net die helfte. Die totaal is onderworpe aan 'n maksimum van 18 maande.                 |

#### *Studente- of tegniese vakleerlingskappe*

14. As alternatief vir die bepalings van regulasie 13, kan die Sekretaris na eie oordeel iemand as kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) toelaat wat minstens vier jaar lank bevredigende diens gelewer het in 'n georganiseerde studente- of tegniese vakleerlingskap goedgekeur deur die Sekretaris: Met dien verstande dat die kandidaat 'n gepaste tegniese kwalifikasie verwerf het en minstens een jaar bestee het aan die tipe werkwinkeldiens waarvan in regulasie 13 (2) melding gemaak word.

#### *Voltydse of stapelkursusse aan tegniese skole, tegniese kolleges of universiteite*

15. (1) As verdere alternatief vir die bepalings van regulasie 13 kan die Sekretaris na eie oordeel iemand as kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) toelaat wat 'n goedgekeurde voltydse of stapelkursus van minstens drie jaar in meganiese ingenieurswese aan 'n goedgekeurde tegniese skool, tegniese kollege of universiteit op bevredigende wyse voltooi het en minstens 24 maande lank in werkwinkels werk verrig het wat vir die opleiding van 'n meganiese tegnikus of ingenieur geskik is: Met dien verstande dat daar van die 24 maande wat by hierdie regulasie vereis word, minstens ses agtereenvolgende maande bestee is aan die tipe werkwinkeldiens waarvan in regulasie 13 (2) melding gemaak word.

(2) Geskikte werkwinkelopleiding gedurende vakansies van die tegniese skool, tegniese kollege of universiteit en tydperke van altesaam hoogstens ses maande bestee aan die werkwinkel se vakleerlingopleidingskemas vir passers en draaiers of aan dergelike opleiding in die werkwinkels van 'n tegniese skool, tegniese kollege of universiteit maak deel uit van die 24 maande diens wat by hierdie regulasie vereis word, maar is onderworpe aan 'n gesamentlike maksimum van nege maande. Afsonderlike tydperke van opleiding mag nie korter as een maand wees nie.

#### *Vergoedende diens*

16. (1) Waar 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) werkwinkeldiens verrig oor die tydperk voorgeskryf by regulasie 13, 14, of 15, kan vir tekorte in sodanige diens vergoed word deur verdere werkwinkeldiens van 'n geskikte aard of deur vergoedende diens op gereelde waghoudiens of deur dagwerk.

|                                                                                            |                                                                                                                               |
|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Repair and maintenance of heavy duty diesel engines                                        | Full time up to a maximum of 3 years.                                                                                         |
| Repair and maintenance of petrol engines                                                   | Full time up to a maximum of 1 year.                                                                                          |
| Metal turning                                                                              | Full time up to a maximum of 2 years.                                                                                         |
| Brass finishing                                                                            | Full time up to a maximum of 1 year.                                                                                          |
| Boiler making or repairing of boilers                                                      | Full time up to a maximum of 1 year.                                                                                          |
| Pattern making                                                                             | Full time up to a maximum of 1 year.                                                                                          |
| Planing, slotting, shaping and milling                                                     | Full time up to a maximum of 1 year.                                                                                          |
| Tool room                                                                                  | Full time up to a maximum of 1 year.                                                                                          |
| Approved schemes of training in the use of hand and small machine tools                    | Full time up to a maximum of 1 year.                                                                                          |
| Smith work                                                                                 | Full time up to a maximum of 6 months.                                                                                        |
| Coppersmith work                                                                           | Full time up to a maximum of 6 months.                                                                                        |
| Welding                                                                                    | Full time up to a maximum of 6 months.                                                                                        |
| Work in drawing office as draughtsman or engineer engaged on arrangement, detail or design | Full time up to 1 year. When more than 1 year has been spent in the drawing office, only half the additional time will count. |
| Electrical shop or repair work not already covered above, excluding work of a minor nature | Full time up to 1 year; additional at half rate. Maximum total 18 months.                                                     |

#### *Student or technical apprenticeships*

14. As an alternative to the requirements of regulation 13, the Secretary may in his discretion admit a candidate for a certificate of competency as Second Engineer-Officer (Coasting) who has performed satisfactory service for not less than four years in an organised student or technical apprenticeship approved by the Secretary: Provided that the candidate has obtained an appropriate technical qualification and has spent not less than one year on the type of workshop service referred to in regulation 13 (2).

#### *Full-time or sandwich courses at technical schools, technical colleges or universities*

15. (1) As a further alternative to the requirements of regulation 13, the Secretary may in his discretion admit a candidate for a certificate of competency as Second Engineer-Officer (Coasting) who has satisfactorily completed at an approved technical school, technical college or university an approved full-time or sandwich course of study of at least three years in mechanical engineering, and has served for not less than 24 months in workshops on suitable work for the training of a mechanical technician, or engineer: Provided that of the 24 months required by this regulation at least six consecutive months shall have been spent on the type of workshop service referred to in regulation 13 (2).

(2) Suitable workshop training carried out during technical school, technical college or university vacations and periods totalling not more than six months spent in works apprentice training schemes for fitters and turners or on similar training in technical school, technical college or university workshops shall count towards the 24 months' service required by this regulation up to an overall maximum of nine months. Separate periods of training shall be of not less than one month's duration.

#### *Compensatory service*

16. (1) Where a candidate for a certificate of competency as Second Engineer-Officer (Coasting) performs workshop service for the period of time prescribed in regulation 13, 14 or 15, deficiencies in such service may be made up by further workshop service of a suitable character or by compensatory service on regular watch or on day-work.



## (2) Vergoedende diens moet verrig word—

(a) of by wyse van dagwerk ter see as Ingenieur-offisier op 'n skip wat kort of lang seereise onderneem;

(b) of by wyse van dagwerk as Ingenieur-offisier op 'n modderskuit, baggerskip of sleepboot wat in 'n hawe optree of die see kort afstande invaar;

(c) of by wyse van dagwerk as Seemasjinis of Assistent-seemasjinis op 'n vissersboot van minstens 225 kW;

(d) of by wyse van gereelde waghoudiens op sodanige skip.

Van die tyd aldus deurgebring op 'n skip wat lang seereise onderneem, kan twee-derdes en van die tyd aldus deurgebring op 'n skip wat kort seereise onderneem of op 'n modderskuit, baggerskip of sleepboot wat in 'n hawe optree of die see kort afstande invaar, kan vier-negendes as (kwalifiserende) werkwinkeldiens gereken word: Met dien verstande dat sodanige werk wat voor die ouderdom van 20 jaar verrig is, nie aldus gereken mag word nie.

(3) Waar 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) oor geen of onvoldoende kwalifiserende werkwinkel- of vergoedende diens soos voorgeskryf by regulasies 13, 14, 15 en 16 (1) en (2) beskik, maar diens op 'n skip verrig het as smeertegnikus en daaropvolgend opgetree het as 'n ongediplomeerde Ingenieur-offisier op waghoudiens by die hoofaandrywingsmasjinerie ten einde 'n sertifikaat as Seemasjinis te verwerf, word die helfte van die tyd aldus deurgebring op 'n skip wat lang seereise onderneem en een derde van die tyd aldus deurgebring op 'n skip wat kort seereise onderneem of op 'n modderskuit, baggerskip of sleepboot wat in 'n hawe optree of die see kort afstande invaar, beskou as geskikte diens om in aanmerking geneem te word, vir die voorgeskrewe kwalifiserende tydperk van werkwinkel- of vergoedende diens: Met dien verstande dat sodanige diens wat voor die ouderdom van 20 jaar verrig is, nie aldus gereken mag word nie.

## (2) Seediens

*Tydperk seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart)*

17. 'n Kandidaat vir 'n sertifikaat van bekwaamheid (stoom of motor of stoom en motor) as Tweede Ingenieur-offisier (Kusvaart) moet na voltooiing van die werkwinkeldiens vereis by regulasies 14, 15 en 16, en na voltooiing van die vergoedende diens (as daar is) wat kragtens regulasie 16 in plaas van werkwinkeldiens aanvaar word, bewys lewer dat hy die volgende tydperk seediens verrig het:

(a) Indien 'n sertifikaat van bekwaamheid (stoom) vereis word, 21 maande, waarvan minstens nege maande aan die ketels en hoofaandrywingsmasjinerie van 'n stoomskip bestee is. Hierdie tydperk van minstens nege maande moet minstens ses maande diens in verband met die ketels en ses maande diens in verband met die hoofaandrywingsmasjinerie insluit: Met dien verstande dat die diens in verband met die ketels en die diens in verband met die hoofaandrywingsmasjinerie gelyktydig mag wees. Die oorblywende 12 maande of deel van 12 maande kon bestee gewees het aan die ketels van 'n stoomskip of aan die hoofaandrywingsmasjinerie van 'n stoomskip of motorskip of aan geskikte hulpmasjiene van 'n stoomskip of motorskip of aan dagwerk;

(b) indien 'n sertifikaat van bekwaamheid (motor) vereis word, 21 maande, waarvan minstens nege maande aan die hoofaandrywingsmasjinerie van 'n motorskip bestee is. Die oorblywende 12 maande of deel van 12 maande kan bestee gewees het aan die hoofaandrywingsmasjinerie

## (2) Compensatory service shall be performed either—

(a) on day-work at sea as Engineer-Officer in a ship making short or long voyages;

(b) on day-work as Engineer-Officer in a hopper, dredger or tug operating in port or proceeding to sea for short distances; or

(c) on day-work as Marine Engineman or Assistant Marine Engineman in a fishing vessel having a power of not less than 225 kW; and

(d) on regular watch in such a ship.

Two thirds of the time so spent in a ship making long voyages and four ninths of the time so spent in a ship making short voyages or in a hopper, dredger or tug operating in port or proceeding to sea for short distances, shall be counted towards the period of qualifying workshop service: Provided that no such work performed before the age of 20 years shall be so counted.

(3) Where a candidate for a certificate of competency as Second Engineer-Officer (Coasting) has had no or insufficient qualifying workshop or compensatory service as prescribed in regulations 13, 14, 15 and 16 (1) and (2), but has been employed in a ship as greaser-technician and subsequent to obtaining a Marine Engineman's certificate served as an uncertificated Engineer-Officer on watch on main propelling machinery, half of the time so spent served in a ship making long voyages and one third of the time so spent served in a ship making short voyages or in a hopper, dredger or tug operating in port or proceeding to sea for short distances, shall be considered as appropriate service to be taken into consideration for the qualifying period of workshop or compensatory service prescribed: Provided that no such service performed before the age of 20 years shall be taken into consideration.

## (2) Sea service

*Period of sea service required of a candidate for a certificate of competency as Second Engineer-Officer (Coasting)*

17. A candidate for a certificate of competency (steam, motor or combined steam and motor) as Second Engineer-Officer (Coasting) shall, after completing the workshop service required in terms of regulations 14, 15 and 16 and after completing the compensatory service (if any) accepted in lieu of workshop service under regulation 16, produce proof of having performed the following period of sea service:

(a) If a certificate of competency (steam) is required, 21 months, of which at least nine months shall have been spent on the boilers and main propelling machinery of a steamship. This period of at least nine months shall include at least six months' service on the boilers and six months' service on the main propelling machinery: Provided that the service on the boilers and the service on the main propelling machinery may have been simultaneous. The remaining 12 months, or balance of 12 months, may have been spent on the boilers of a steamship or on the main propelling machinery of a steamship or motorship, or on suitable auxiliaries of a steamship or motorship, or on day-work;

(b) if a certificate of competency (motor) is required, 21 months, of which at least nine months shall have been spent on the propelling machinery of a motorship. The remaining 12 months, or balance of 12 months, may have been spent on the main propelling machinery



van 'n stoomskip of motorskip of aan geskikte hulp-masjiene van 'n stoomskip of motorskip, of hoogstens ses maande daarvan kan aan die ketels van 'n stoomskip, of aan dagwerk bestee gewees het;

(c) indien 'n gekombineerde sertifikaat van bekwaamheid (stoom en motor) vereis word, 24 maande, waarvan minstens—

(i) nege maande aan die ketels en hoofaandrywingsmasjinerie van 'n stoomskip bestee is. Hierdie tydperk van minstens nege maande moet minstens ses maande diens in verband met die ketels en ses maande diens in verband met die hoofaandrywingsmasjinerie insluit: Met dien verstande dat die diens in verband met die ketels en die diens in verband met die hoofaandrywingsmasjinerie gelyktydig mag wees; en

(ii) nege maande aan die hoofaandrywingsmasjinerie van 'n motorskip bestee is. Die oorblywende ses maande of deel van ses maande kan aan die ketels van 'n stoomskip of aan die hoofaandrywingsmasjinerie van 'n stoomskip of motorskip of aan geskikte hulpmasjiene van 'n stoomskip of motorskip of aan dagwerk bestee gewees het.

*Tydperk seediens vereis vir die endossering van 'n sertifikaat van bekwaamheid as Tweede Ingenieursoffisier (Kusvaart)*

18. 'n Kandidaat vir die Endossering van 'n sertifikaat van bekwaamheid (stoom of motor) as Tweede Ingenieursoffisier (Kusvaart) moet bewys lewer dat hy die volgende tydperk seediens verrig het:

(a) Indien die motorendossement van 'n sertifikaat van bekwaamheid (stoom) vereis word, drie maande benewens die seediens wat by regulasie 17 (a) vereis word: Met dien verstande dat altesaam minstens nege maande diens in verband met die hoofaandrywingsmasjinerie van 'n motorskip verrig moet wees;

(b) indien die stoomendossement van 'n sertifikaat van bekwaamheid (motor) vereis word, drie maande benewens die seediens wat by regulasie 17 (b) vereis word: Met dien verstande dat altesaam minstens nege maande diens in verband met die ketels en hoofaandrywingsmasjinerie van 'n stoomskip verrig moet wees. Hierdie tydperk van minstens nege maande moet minstens ses maande diens in verband met die ketels en ses maande diens in verband met die hoofaandrywingsmasjinerie insluit: Met dien verstande dat die diens in verband met die ketels en in verband met die hoofaandrywingsmasjinerie gelyktydig mag wees.

*Tipe seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieursoffisier (Kusvaart) en endossement*

19. (1) Die seediens wat ooreenkomstig regulasies 17 en 18 van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieursoffisier (Kusvaart) en endossement vereis word, moet verrig gewees het op gereelde waghoudiens van altesaam minstens agt uur uit elke 24 uur diens waarop aanspraak gemaak word as—

(a) Ingenieursoffisier ter see op 'n skip wat kort of lang seereise onderneem; of

(b) Ingenieursoffisier op 'n modderskuit, baggerskip of sleepboot wat in 'n hawe optree of die see kort afstande invaar; of

(c) Seemasjinis of Assisent-seemasjinis op 'n vissersboot van minstens 225 kW.

(2) Diens op 'n skip vermeld in subregulasie (1) (a) word alles as diens gereken, terwyl twee derdes van die diens op 'n skip vermeld in subregulasies (1) (b) en (1) (c) as diens gereken word.

of a steamship or motorship, or on suitable auxiliaries of a steamship or motorship, or to the extent of not more than six months on the boilers of a steamship, or on day work.

(c) If a combined certificate of competency (steam and motor) is required, 24 months, of which at least—

(i) nine months shall have been spent on the boilers and main propelling machinery of a steamship. This period of at least nine months shall include at least six months' service on the boilers and six months' service on the main propelling machinery: Provided that the service on the boilers and the service on the main propelling machinery may have been simultaneous; and

(ii) nine months shall have been spent on the main propelling machinery of a motorship. The remaining six months, or balance of six months, may have been spent on the boilers of a steamship or on the main propelling machinery of a steamship or motorship, or on suitable auxiliaries of a steamship or motorship, or on day work.

*Period of sea service required for the endorsement of a certificate of competency as Second Engineer-Officer (Coasting)*

18. A candidate for the endorsement of a certificate of competency (steam or motor) as Second Engineer-Officer (Coasting), shall produce proof of having performed the following period of sea service:

(a) If a motor endorsement of a certificate of competency (steam) is required, three months in addition to the sea service required in terms of regulation 17 (a): Provided that not less than nine months' service in all shall have been served on the main propelling machinery of a motorship;

(b) if a steam endorsement of a certificate of competency (motor) is required, three months in addition to the sea service required in terms of regulation 17 (b): Provided that not less than nine months' service in all shall have been served on the boilers and main propelling machinery of a steamship. This period of at least nine months shall include at least six months' service on the boilers and six months' service on the main propelling machinery: Provided that the service on the boilers and on the main propelling machinery may have been simultaneous.

*Type of sea service required of a candidate for a certificate of competency as Second-Engineer-Officer (Coasting) and endorsement*

19. (1) The sea service required in terms of regulations 17 and 18 of a candidate for a certificate of competency as Second Engineer-Officer (Coasting) and endorsement, shall have been performed on regular watch totalling at least eight hours out of every 24 hours' service claimed, as—

(a) Engineer-Officer at sea in a ship making short or long voyages;

(b) Engineer-Officer in a hopper, dredger or tug operating in port or proceeding to sea for short distances;

(c) Marine Engineman or Assistant Marine Engineman in a fishing vessel having a power of not less than 225 kW.

(2) Service in a ship mentioned in subregulation (1) (a) shall be counted at full rate, whereas service in a ship mentioned in subregulations (1) (b) and (1) (c) shall be counted at two-thirds rate.

(3) Dagwerk ter see binne die masjien- of ketelruime van 'n skip vermeld in paragrafe (a) en (c) en dagwerk binne die masjien- of ketelruime van 'n skip vermeld in subregulasie (1) kan ingereken word as deel van die kwalifiserende diens op gereelde waghoudiens waarvan in daardie subregulasie melding gemaak word, dog hoogstens die helfte van sodanige dagwerk, behoudens 'n maksimum van ses maande, kan aldus ingereken word.

*Kwytskelding van seediens vir 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart)*

20. 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) kan hoogstens drie maande seediens kwytgeskel word as hy, alvorens hy met sy kwalifiserende seediens begin het, in die vakke "Algemene Ingenieurswetenskap" en "Hitte en Hittewerktuie" van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) geslaag het of as hy Deel A van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) deurgekome het of as hy 'n sertifikaat, diploma of graad verwerf het wat deur die Sekretaris as kwalifikasie vir algehele of gedeeltelike vrystelling van Deel A van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) erken word.

#### B. KANDIDAAT VIR 'N CERTIFIKAAT VAN BEKWAAMHEID AS HOOF-INGENIEUROFFISIER (KUSVAART) EN ENDOSSEMENT

*Tydperk seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart)*

21. 'n Kandidaat vir 'n sertifikaat van bekwaamheid (stoom of motor of stoom en motor) as Hoof-ingenieur-offisier (Kusvaart) moet die houer wees van 'n geldige sertifikaat van bekwaamheid (stoom of motor of stoom en motor) as Tweede Ingenieur-offisier (Kusvaart) en moet, terwyl hy die houer van so 'n sertifikaat was, die tydperk toepaslike seediens voltooi het wat by regulasie 17 vereis word.

*Tydperk seediens vereis vir die endossering van 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart)*

22. 'n Kandidaat vir die endossering van 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) moet die tydperk seediens voltooi het wat by regulasie 18 vir die endossering van 'n sertifikaat van bekwaamheid (stoom of motor, na gelang van die geval) as Tweede Ingenieur-offisier (Kusvaart) vereis word.

*Tipe seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) en endossement*

23. (1) Die seediens wat by regulasies 21 en 22 van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) en endossement vereis word, moet verrig gewees het terwyl in die hoedanigheid van—

(a) Ingenieur-offisier ter see op 'n skip wat kort of lang seereise onderneem; of

(b) Ingenieur-offisier op 'n modderskuit, baggerskip of sleepboot wat in 'n hawe optree of die see kort afstande invaar; of

(c) Seemasjinis op 'n vissersboot van minstens 225 kW,

minstens agt uit elke 24 uur diens waarop aanspraak gemaak word, volle beheer oor 'n gereelde waghoudiens gehad het.

(3) Day-work at sea carried out within the engine or boiler spaces of a ship mentioned in paragraphs (a) and (c) and day-work carried out within the engine or boiler spaces of a ship mentioned in subregulation (1) (b), may be accepted towards the qualifying service on regular watch referred to in that subregulation, and shall be counted at half rate subject to a maximum allowance of six months.

*Remission of sea service for a candidate for a certificate of competency as Second Engineer-Officer (Coasting)*

20. A candidate for a certificate of competency as Second Engineer-Officer (Coasting) who, before commencing his qualifying sea service, has passed in the subjects "General Engineering Science" and "Heat and Heat Engines" of the examination for a certificate of competency as Second Engineer-Officer (Coasting) or who has passed Part A of the examination for a certificate of competency as Second Engineer-Officer (Foreign-going) or who has obtained a certificate, diploma or degree recognised by the Secretary as conferring full or partial exemption from Part A of the examination for a certificate of competency as Second Engineer-Officer (Foreign-going), may be granted a remission of sea service not exceeding three months.

#### B. CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS CHIEF ENGINEER-OFFICER (COASTING) AND ENDORSEMENT

*Period of sea service required of a candidate for a certificate of competency as Chief Engineer-Officer (Coasting)*

21. A candidate for a certificate of competency (steam, motor or combined steam and motor) as Chief Engineer-Officer (Coasting) shall hold a valid certificate of competency (steam, motor or combined steam and motor) as Second Engineer-Officer (Coasting) and, whilst holding such a certificate, shall have completed the period of appropriate sea service required in terms of regulation 17.

*Period of sea service required for the endorsement of a certificate of competency as Chief Engineer-Officer (Coasting)*

22. A candidate for the endorsement of a certificate of competency as Chief Engineer-Officer (Coasting) shall have completed the period of sea service required in terms of regulation 18 for the endorsement of a certificate of competency (steam or motor, as the case may be) as Second Engineer-Officer (Coasting).

*Type of sea service required of a candidate for a certificate of competency as Chief Engineer-Officer (Coasting) and endorsement*

23. (1) The sea service required in terms of regulations 21 and 22 of a candidate for a certificate of competency as Chief Engineer-Officer (Coasting) and endorsement, shall have been performed in full charge of a regular watch totalling at least eight hours out of every 24 hours' service claimed, as—

(a) Engineer-Officer at sea in a ship making short or long voyages; or

(b) Engineer-Officer in a hopper, dredger or tug operating in port or proceeding to sea for short distances; or

(c) Marine Engineman in a fishing vessel having a power of not less than 225 kW.



(2) Diens op 'n skip vermeld in subregulasie (1) (a) tel alles, maar van diens op 'n skip vermeld in subregulasies (1) (b) en (1) (c) tel net twee derdes.

(3) Dagwerk word nie aanvaar nie.

*Kwytskelding van seediens vir 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart)*

24. 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) kan hoogstens drie maande seediens kwyteskel word as hy, alvorens hy met sy kwalifiserende seediens begin het, in die vakke "Algemene Ingenieurswetenskap" en "Hitte en Hittewerktuie" van die eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) geslaag het of as hy Deel A van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) of Hoof-ingenieur-offisier (Vreemde Vaart) deurgekom het of as hy 'n sertifikaat, diploma of graad verwerf het wat deur die Sekretaris as kwalifikasie vir algehele of gedeeltelike vrystelling van Deel A van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) erken word.

*Eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) sonder dat 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) voorgelê word*

25. (1) 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) wat geen geleentheid gehad het om 'n geldige sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) te verwerf nie, kan behoudens die bepalinge van subregulasie (2) tot die eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) toegelaat word: Met dien verstande dat die Sekretaris daarvan oortuig is dat die kandidaat se diens, vakleerlingskap of tegniese studies, met inbegrip van werkinkeldiens, nie van 'n laer gehalte is as wat vir die toekenning van 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) kragtens hierdie regulasies vereis word nie.

(2) 'n Kandidaat vermeld in subregulasie (1) moet bewys lewer dat hy minstens vier jaar ter see op 'n stoomskip of motorskip wat kort of lang seereise onderneem, of minstens ses jaar op 'n modderskuit, baggerskip of sleepboot wat in 'n hawe opgetree of die see kort afstande ingevaar het, as Ingenieur-offisier diens gedoen het, of minstens ses jaar as Seemasjinis op 'n vissersboot van minstens 225 kW; en van die tydperk van vier jaar moet hy minstens 18 maande en van die tydperk van ses jaar minstens 27 maande lank volle beheer oor 'n gereelde waghoudiens van altesaam minstens agt uur uit elke 24 uur diens waarop aanspraak gemaak word, by die ketels en hoofaandrywingsmasjinerie van 'n stoomskip of by die hoofaandrywingsmasjinerie van 'n motorskip gehad het: Met dien verstande dat die diens wat by hierdie subregulasie voorgeskryf word, in die geval van 'n kandidaat wat al die diens of 'n deel van sodanige diens op 'n Suid-Afrikaanse skip verrig het, voor 5 April 1968 voltooi is.

(3) Indien 'n kandidaat wat in subregulasie (1) vermeld word, nie in die eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) slaag nie, maar toon dat hy die standaard bereik het wat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) vereis word, kan die Minister so 'n sertifikaat aan hom toeken: Met dien verstande dat geen deel van die eksamengeld aan hom terugbetaal word nie.

(2) Service in a ship mentioned in subregulation (1) (a) shall be counted at full rate, whereas service in a ship mentioned in subregulations (1) (b) and (1) (c) shall be counted at two-thirds rate.

(3) Day-work shall not be accepted.

*Remission of sea service for a candidate for a certificate of competency as Chief Engineer-Officer (Coasting)*

24. A candidate for a certificate of competency as Chief Engineer-Officer (Coasting) who, before commencing his qualifying sea service, has passed in the subjects "General Engineering Science" and "Heat and Heat Engines" of the examination for a certificate of competency as Chief Engineer-Officer (Coasting) or who has passed Part A of the examination for a certificate of competency as Second Engineer-Officer (Foreign-going) or Chief Engineer-Officer (Foreign-going) or who has obtained a certificate, diploma or degree recognised by the Secretary as conferring full or partial exemption from Part A of the examination for a certificate of competency as Second Engineer-Officer (Foreign-going), may be granted a remission of sea service not exceeding three months.

*Examination for a certificate of competency as Chief Engineer-Officer (Coasting) without the production of a certificate of competency as Second Engineer-Officer (Coasting)*

25. (1) A candidate for a certificate of competency as Chief Engineer-Officer (Coasting) who has had no opportunity to obtain a valid certificate of competency as Second Engineer-Officer (Coasting) may, subject to the provisions of subregulation (2), be admitted to the examination for a certificate of competency as Chief Engineer-Officer (Coasting): Provided the Secretary is satisfied that the character of the candidate's service, apprenticeship or technical studies, including workshop service, is of a standard not lower than that required for the grant under these regulations of a certificate of competency as Chief Engineer-Officer (Coasting).

(2) A candidate referred to in subregulation (1) shall produce proof of having served for at least four years as Engineer-Officer at sea in a steamship or motorship making short or long voyages or at least six years as Engineer-Officer in a hopper, dredger or tug which operated in port or which proceeded to sea for short distances or at least six years as Marine Engineman in a fishing vessel having a power of not less than 225 kW; of the period of four years at least 18 months and of the period of six years at least 27 months, shall have been spent in full charge of a regular watch, totalling at least eight hours out of every 24 hours' service claimed, on the boilers and main propelling machinery of a steamship or on the main propelling machinery of a motorship: Provided that the service prescribed in this subregulation shall, in the case of a candidate who has performed all or part thereof in a South African ship, have been completed before 5 April 1968.

(3) If a candidate referred to in subregulation (1) fails to pass the examination for a certificate of competency as Chief Engineer-Officer (Coasting), but shows that he has reached the standard required for a certificate of competency as Second Engineer-Officer (Coasting), the Minister may grant him such certificate: Provided that no part of the examination fee shall be refunded to him.

## HOOFSTUK III

KWALIFIKASIES VEREIS VAN 'N KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS TWEDE INGENIEUROFFISIER (VREEMDE VAART) EN ENDOSSEMENT OF HOOF-INGENIEUROFFISIER (VREEMDE VAART) EN ENDOSSEMENT

A. KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS TWEDE INGENIEUROFFISIER (VREEMDE VAART) EN ENDOSSEMENT

*Ouderdom van kandidaat*

26. 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) moet minstens 22 jaar oud wees.

(1) *Werkwinkeldiens*

*Diens as leerlingingenieur of ambagsgesel*

27. (1) 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) moet bewys lewer dat hy sedert bereiking van die ouderdom van 16 jaar minstens vier jaar lank as leerlingingenieur of ambagsgesel bevredigende diens gelewer het in werk wat vir die opleiding van 'n tegnikus in die vervaardiging of onderhoud van masjinerie geskik is.

(2) Minstens nege maande uit die vier jaar werkwinkeldiens wat by subregulasie (1) vereis word, moet bestee gewees het aan die montering, oprigting of herstel van masjinerie van 'n geskikte grootte of beskrywing (bv. 'n werk aan skeepsmasjiene en taamlik groot hulpmasjiene van 'n tipe wat in skepe geïnstalleer word, of aan aandrywingsmasjiene van dergelike waarde in die opleiding van skeepsingenieur) hetsy in of buite die werkwinkel.

(3) Die oorblywende drie jaar en drie maande kon bestee gewees het aan werk van die aard voorgeskryf in subregulasie (2) of aan ander geskikte werk, onderworpe daaraan dat tydsbesteding aan sekere gespesialiseerde tipes werk op die volgende grondslag geskied:

|                                                                                                           |                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Metaaldraaiwerk.....                                                                                      | Voltyds tot hoogstens 2 jaar.                                                                                             |
| Geelkoperafwerking.....                                                                                   | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Maak of herstel van ketels.....                                                                           | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Modelmakery.....                                                                                          | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Skaafwerk, gleufwerk, sterkarm-skaafwerk en freeswerk                                                     | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Gereedskapkamer.....                                                                                      | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Goedgekeurde skemas vir opleiding in die gebruik van handgereedskap en klein masjiengereedskap            | Voltyds tot hoogstens 1 jaar.                                                                                             |
| Smidswerk.....                                                                                            | Voltyds tot hoogstens 6 maande.                                                                                           |
| Kopersmidswerk.....                                                                                       | Voltyds tot hoogstens 6 maande.                                                                                           |
| Sweiswerk.....                                                                                            | Voltyds tot hoogstens 6 maande.                                                                                           |
| Werk in tekenkantoor as tekenaar of ingenieur werksaam in verband met samestelling, detail of ontwerp     | Voltyds tot 1 jaar. Indien meer as 1 jaar in die tekenkantoor deurgebring is, tel net die helfte van die addisionele tyd. |
| Elektriese winkel of herstelwerk nie reeds hierbo gedek nie, uitgesonderd werk van minder belangrike aard | Voltyds tot 1 jaar en daarbo tel net die helfte. Die totaal is onderworpe aan 'n maksimum van 18 maande.                  |
| Instrument en afstandbeheertoerustingmontering                                                            | Voltyds tot hoogstens 6 maande.                                                                                           |

*Studente- of tegniese vakleerlingskappe*

28. As alternatief vir die bepalings van regulasie 27 kan die Sekretaris na eie oordeel iemand as kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) toelaat wat minstens vier jaar lank bevredigende diens gelewer het in 'n georganiseerde studente- of tegniese vakleerlingskap goedgekeur deur die Sekretaris: Met dien verstande dat die kandidaat 'n gepaste tegniese kwalifikasie verwerf het en minstens nege maande bestee het aan die montering, oprigting of herstel van die tipe masjinerie waarvan in regulasie 27 (2) melding gemaak word.

## CHAPTER III

QUALIFICATIONS REQUIRED OF A CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS SECOND ENGINEER-OFFICER (FOREIGN-GOING) AND ENDORSEMENT, OR CHIEF ENGINEER-OFFICER (FOREIGN-GOING) AND ENDORSEMENT

A. CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS SECOND ENGINEER-OFFICER (FOREIGN-GOING) AND ENDORSEMENT

*Age of candidate*

26. A candidate for a certificate of competency as Second Engineer-Officer (Foreign-going), shall not be less than 22 years of age.

(1) *Workshop service*

*Service as apprentice engineer or journeyman*

27. (1) A candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) shall prove that since reaching the age of 16 years he has served satisfactorily for not less than four years as an apprentice engineer or journeyman on work suitable for the training of a technician in the manufacture or maintenance of machinery.

(2) Not less than nine months of the four years workshop service required in terms of subregulation (1) shall have been devoted to fitting, erecting or repairing machinery of a suitable size or description (e.g. work on marine engines and substantial auxiliary machinery of a type fitted in ships, or on motive power machinery which has a similar value in the training of marine engineers), either in the works or outside.

(3) The remaining three years and three months may have been spent on work of the nature prescribed in subregulation (2) or on other suitable work, subject to a time allowance for certain specialised types of work on the following basis:

|                                                                                            |                                                                                                                              |
|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Metal turning.....                                                                         | Full time up to a maximum of 2 years.                                                                                        |
| Brass finishing.....                                                                       | Full time up to a maximum of 1 year.                                                                                         |
| Boiler making or repairing of boilers                                                      | Full time up to a maximum of 1 year.                                                                                         |
| Pattern making.....                                                                        | Full time up to a maximum of 1 year.                                                                                         |
| Planing, slotting, shaping and milling                                                     | Full time up to a maximum of 1 year.                                                                                         |
| Tool room.....                                                                             | Full time up to a maximum of 1 year.                                                                                         |
| Approved schemes of training in the use of hand and small machine tools                    | Full time up to a maximum of 1 year.                                                                                         |
| Smith work.....                                                                            | Full time up to a maximum of 6 months.                                                                                       |
| Coppersmith work.....                                                                      | Full time up to a maximum of 6 months.                                                                                       |
| Welding.....                                                                               | Full time up to a maximum of 6 months.                                                                                       |
| Work in drawing office as draughtsman or engineer engaged on arrangement, detail or design | Full time up to 1 year. When more than 1 year has been spent in the drawing office only half the additional time will count. |
| Electrical shop or repair work not already covered above, excluding work of a minor nature | Full time up to 1 year additional at half-rate. Maximum total 18 months.                                                     |
| Instrument and distant control gear fitting                                                | Full time up to a maximum of 6 months.                                                                                       |

*Student or technical apprenticeships*

28. As an alternative to the requirements of regulation 27, the Secretary may in his discretion admit a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) who has performed satisfactory service for not less than four years in an organised student or technical apprenticeship approved by the Secretary: Provided that the candidate has obtained an appropriate technical qualification and has devoted not less than nine months to fitting, erecting or repairing the type of machinery referred to in regulation 27 (2).



*Voltydse of stapelkursusse aan tegniese skole, tegniese kolleges of universiteite*

29. (1) As verdere alternatief vir die bepalings van regulasie 27 kan die Sekretaris na eie oordeel iemand as kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) toelaat wat 'n goedgekeurde voltydse of stapelkursus van minstens drie jaar in meganiese ingenieurswese aan 'n goedgekeurde tegniese skool, tegniese kollege of universiteit op bevredigende wyse voltooi het en minstens 24 maande lank in werkwinkels werk verrig het wat vir die opleiding van 'n meganiese tegnikus of ingenieur geskik is: Met dien verstande dat daar van die 24 maande wat by hierdie regulasie vereis word, minstens ses agtereenvolgende maande bestee is aan die montering, oprigting of herstel van die tipe masjinerie waarvan in regulasie 27 (2) melding gemaak word.

(2) Geskikte werkwinkelopleiding gedurende vakansies van die tegniese skool, tegniese kollege of universiteit en tydperke van altesaam hoogstens ses maande bestee aan die werkwinkel se vakleerlingopleidingskemas vir passers en draaiers of aan dergelike opleiding in die werkwinkels van 'n tegniese skool, tegniese kollege of universiteit maak deel uitmaak van die 24 maande diens wat by hierdie regulasie vereis word, maar is onderworpe aan 'n gesamentlike maksimum van nege maande. Afsonderlike tydperke van opleiding mag nie korter as een maand wees nie.

*Kadetopleidingskursus vir ingenieur-offisiere*

30. (1) As 'n verdere alternatief vir die bepalings van regulasie 27, kan die Sekretaris na eie oordeel iemand as kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart), wat 'n goedgekeurde kadetopleidingskursus van vier jaar vir Ingenieur-offisiere voltooi het, toelaat. Die kursus bestaan normaalweg uit 'n aanvangstydperk vir geselekteerde kandidate ter see, gevolg deur 'n tydperk van praktiese werkwinkelopleiding en voltydse studie aan 'n goedgekeurde kollege vir gevorderde tegniese onderrig, verdere praktiese werkwinkeldiens om die tyd sodanig deurgebring op 12 maande te staan te bring en laastens verdere seediens om die vierjarige kursus te voltooi.

(2) Kadette wat die opleidingskursus op bevredigende wyse voltooi het en in aanmerking kom vir die toekenning van die Nasionale Tegniese Sertifikaat (Skeepsingenieurswese), kwalifiseer ook vir vrystelling van sekere vakke van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart). Kwytstelling van drie maande kwalifiserende diens sal terselfdertyd verleen word.

(3) Kadette wat die opleidingskursus op 'n hoër standaard bevredigend voltooi het en in aanmerking kom vir die toekenning van die Hoër Nasionale Tegniese Sertifikaat (Skeepsingenieurswese) kwalifiseer ook vir vrystelling van sekere vakke van die eksamen vir beide die sertifikaat van bekwaamheid as Tweede Ingenieur-offisier en Hoofingenieur-offisier van skepe op vreemde vaart. Kwytstelling van drie maande kwalifiserende seediens sal terselfdertyd in elke geval verleen word.

(4) Die vrystelling verleen ingevolge subregulasies (2) en (3) hierbo kan na eie goeddunke deur die eksaminator toegestaan word op 'n vak-voor-vak-grondslag oor die geheel van die eksamen.

*Vergoedende diens*

31. (1) Waar 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) werkwinkeldiens verrig oor die tydperk voorgeskryf in regulasies 27, 28, 29 of 30 kan vir tekorte in sodanige diens vergoed word deur verdere werkwinkeldiens van 'n geskikte aard of deur vergoedende diens op gereelde waghoudiens of deur dagwerk ter see.

*Full-time or sandwich courses at technical schools, technical colleges or universities*

29. (1) As a further alternative to the requirements of regulation 27, the Secretary may in his discretion admit a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) who has satisfactorily completed at an approved technical school, technical college or university an approved full-time or sandwich course of study of at least three years in mechanical engineering, and has served for not less than 24 months in workshops on suitable work for the training of a mechanical technician or engineer: Provided that of the 24 months required by this regulation at least six consecutive months shall have been devoted to fitting, erecting or repairing the type of machinery referred to in regulation 27 (2).

(2) Suitable workshop training carried out during technical school, technical college or university vacations and periods totalling not more than six months spent in works apprentice training schemes for fitters and turners or on similar training in technical school, technical college or university workshops shall count towards the 24 months' service required by this regulation up to an overall maximum of nine months. Separate periods of training shall be of not less than one month's duration.

*Engineer-officer cadet training course*

30. (1) As a further alternative to the requirements of regulation 27, the Secretary may in his discretion admit a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) who has satisfactorily completed an approved Engineer-Officer cadet training course of four years duration. The course normally consists of an initial period at sea for selected candidates followed by a period of practical workshop training and full time study at an approved college for advanced technical education, further practical workshop training to bring the time so spent to twelve months, and finally further sea service at sea to complete the four year course.

(2) Cadets who satisfactorily complete the training course and qualify for the award of the National Certificate for Technicians (Marine Engineering) also qualify for exemption from certain subjects of the examination for a certificate of competency as Second Engineer-Officer of a Foreign-going ship. At the same time a remission of three months of qualifying sea service will be allowed.

(3) Cadets who satisfactorily complete the training course at a higher level and qualify for the award of the Higher National Certificate for Technicians (Marine Engineering) also qualify for exemption from certain subjects of the examinations for both the Certificate of competency as Second Engineer-Officer and Chief Engineer-Officer of a Foreign-going ship. At the same time a remission of three months of qualifying sea service will be allowed in each case.

(4) The exemptions granted under subregulations (2) and (3) above may at the discretion of the examiner be granted on a subject for subject basis over the whole of the examinations.

*Compensatory service*

31. (1) Where a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) performs workshop service for the period of time prescribed in regulations 27, 28, 29 or 30, deficiencies in such service may be made up by further workshop service of a suitable character or by compensatory service on regular watch or on day-work at sea.

## (2) Vergoedende seediens moet verrig word of—

(a) by wyse van dagwerk as Ingenieur-offisier op 'n skip van minstens 280 kW wat kort of lang seereise onderneem; of

(b) by wyse van gereelde waghoudiens op so 'n skip.

Van die tyd aldus deurgebring op 'n skip wat lang seereise onderneem, kan twee derdes van die tyd aldus deurgebring op 'n skip wat kort seereise onderneem, kan vier negendes as kwalifiserende werkwinkeldiens gereken word: Met dien verstande dat sulke werk wat voor die ouderdom van 20 jaar verrig is, nie aldus gereken mag word nie.

## (2) Seediens

*Tydperk seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart)*

32. 'n Kandidaat vir 'n sertifikaat van bekwaamheid (stoom of motor of stoom en motor) as Tweede Ingenieur-offisier (Vreemde Vaart) moet na voltooiing van die werkwinkeldiens vereis by regulasie 27, gelees met regulasies 28, 29, 30 en 31 en na voltooiing van die seediens (as daar is) wat kragtens regulasie 31 in plaas van werkwinkeldiens aanvaar word, bewys lewer dat hy die volgende tydperk seediens verrig het:

(a) Indien 'n sertifikaat van bekwaamheid (stoom) vereis word, 21 maande, waarvan minstens nege maande aan die ketels en hoofaandrywingsmasjinerie van 'n stoomskip bestee is. Hierdie tydperk van minstens nege maande moet minstens ses maande diens in verband met die ketels en ses maande diens in verband met die hoofaandrywingsmasjinerie insluit: Met dien verstande dat die diens in verband met die ketels en die diens in verband met die hoofaandrywingsmasjinerie gelyktydig mag wees. Die oorblywende 12 maande of deel van 12 maande kon bestee gewees het aan die ketels van 'n stoomskip of aan die hoofaandrywingsmasjinerie van 'n stoomskip of motorskip of aan geskikte hulpmasjiene van 'n stoomskip of motorskip of aan dagwerk;

(b) indien 'n sertifikaat van bekwaamheid (motor) vereis word, 21 maande, waarvan minstens nege maande aan die hoofaandrywingsmasjinerie van 'n motorskip bestee is. Die oorblywende 12 maande of deel van 12 maande kon bestee gewees het aan die hoofaandrywingsmasjinerie van 'n stoomskip of motorskip, of aan geskikte hulpmasjiene van 'n stoomskip of motorskip of hoogstens ses maande daarvan kon aan die ketels van 'n stoomskip, of aan dagwerk bestee gewees het;

(c) indien 'n gekombineerde sertifikaat van bekwaamheid (stoom en motor) vereis word, 24 maande, waarvan minstens—

(i) nege maande aan die ketels en hoofaandrywingsmasjinerie van 'n stoomskip bestee is. Hierdie tydperk van minstens nege maande moet minstens ses maande diens in verband met die ketels en ses maande diens in verband met die hoofaandrywingsmasjinerie insluit: Met dien verstande dat die diens in verband met die ketels en die diens in verband met die hoofaandrywingsmasjinerie gelyktydig mag wees; en

(ii) nege maande aan die hoofaandrywingsmasjinerie van 'n motorskip bestee is. Die oorblywende ses maande of deel van ses maande kon aan die ketels van 'n stoomskip of aan die hoofaandrywingsmasjinerie van 'n stoomskip of motorskip of aan geskikte hulpmasjiene van 'n stoomskip of motorskip of aan dagwerk bestee gewees het.

## (2) Compensatory sea service shall be performed either—

(a) on day-work as Engineer-Officer in a ship having a power of not less than 280 kW making short or long voyages; or

(b) on regular watch in such a ship.

Two-thirds of the time so spent in a ship making long voyages and four-ninths of the time so spent in a ship making short voyages, shall be counted towards the period of qualifying workshop service: Provided that no such work performed before the age of 20 years shall be so counted.

## (2) Sea service

*Period of sea service required of a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going)*

32. A candidate for a certificate of competency (steam, motor or combined steam and motor) as Second Engineer-Officer (Foreign-going) shall, after completing the workshop service required in terms of regulation 27 read with regulations 28, 29, 30 and 31, and after completing the sea service (if any) accepted in lieu of workshop service under regulation 31, produce proof of having performed the following period of sea service:

(a) If a certificate of competency (steam) is required, 21 months, of which at least nine months shall have been spent on the boilers and main propelling machinery of a steamship. This period of at least nine months shall include at least six months' service on the boilers and six months' service on the main propelling machinery: Provided that the service on the boilers and the service on the main propelling machinery may have been simultaneous. The remaining 12 months, or balance of 12 months, may have been spent on the boilers of a steamship or on the main propelling machinery of a steamship or motorship, or on suitable auxiliaries of a steamship or motorship, or on day-work;

(b) if a certificate of competency (motor) is required, 21 months, of which at least nine months shall have been spent on the main propelling machinery of a motorship. The remaining 12 months, or balance of 12 months, may have been spent on the main propelling machinery of a steamship or motorship, or on suitable auxiliaries of a steamship or motorship, or to the extent of not more than six months on the boilers of a steamship, or on day-work;

(c) if a combined certificate of competency (steam and motor) is required, 24 months, of which at least—

(i) nine months shall have been spent on the boilers and main propelling machinery of a steamship. This period of at least nine months shall include at least six months' service on the boilers and six months' service on the main propelling machinery: Provided that the service on the boilers and the service on the main propelling machinery may have been simultaneous; and

(ii) nine months shall have been spent on the main propelling machinery of a motorship. The remaining six months, or balance of six months, may have been spent on the boilers of a steamship or on the main propelling machinery of a steamship or motorship, or on suitable auxiliaries of a steamship or motorship, or on day-work.



*Tydperk seediens vereis vir die endossering van 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart)*

33. 'n Kandidaat vir die endossering van 'n sertifikaat van bekwaamheid (stoom of motor) as Tweede Ingenieur-offisier (Vreemde Vaart) moet bewys lewer dat hy die volgende tydperk seediens verrig het:

(a) Indien die motorendossement van 'n sertifikaat van bekwaamheid (stoom) vereis word, drie maande benewens die seediens wat by regulasie 32 (a) vereis word: Met dien verstande dat altesaam minstens nege maande diens in verband met die hoofaandrywingsmasjinerie van 'n motorskip verrig moet wees;

(b) indien die stoomdossesment van 'n sertifikaat van bekwaamheid (motor) vereis word, nege maande benewens die seediens wat by regulasie 32 (b) vereis word: Met dien verstande dat altesaam minstens nege maande diens in verband met die ketels en hoofaandrywingsmasjinerie van 'n stoomskip verrig moet wees. Hierdie tydperk van minstens nege maande moet minstens ses maande diens in verband met die ketels en ses maande diens in verband met die hoofaandrywingsmasjinerie insluit: Met dien verstande dat die diens in verband met die ketels en in verband met die hoofaandrywingsmasjinerie gelyktydig mag wees.

*Tipe seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) en endossement*

34. (1) Die seediens wat by regulasies 32 en 33 vereis word van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) en endossement, moet deur die kandidaat in die hoedanigheid van Ingenieur-offisier ter see op 'n skip van minstens 280 kW wat kort of lang seereise onderneem, verrig gewees het op gereelde waghoudiens van altesaam minstens agt uur uit elke 24 uur diens waarop aanspraak gemaak word. Diens op so 'n skip wat lang seereise onderneem, tel alles maar van diens op so 'n skip wat kort seereise onderneem, tel net twee derdes.

(2) Dagwerk ter see binne die masjien- of ketelruime van 'n skip vermeld in subregulasie (1) kan ingereken word as deel van die kwalifiserende diens op gereelde waghoudiens waarvan in daardie subregulasie melding gemaak word en tel alles tot 'n maksimum van agt maande, dog hoogstens die helfte van enige verdere dagwerk, onderworpe aan 'n maksimum van 12 maande kan aldus ingereken word.

(3) Van diens op sleepbote, modderskuite, baggerskepe, loodsbote en vissersbote van minstens 280 kW tel 'n kwart, onderworpe aan 'n maksimum van ses maande: Met dien verstande dat sodanige diens nie as kwalifiserende diens soos vereis by regulasie 33 mag tel nie.

(4) (a) Diens wat deur Ingenieur-offisiere verrig word op skepe wat volgens 'n ander waghouroetine optree as die tradisionele ag-uur-dienstydperk, kan aanvaar word indien die eksaminator daarvan oortuig is dat sodanige werk verrig, voorsiening maak vir 'n redelike gebalanseerde stelsel van diens.

(b) Wanneer 'n Ingenieur-offisier in diens op 'n skip wat volgens 'n goedgekeurde ooreenkoms optree, genomineer word om in algehele beheer te wees van die masjienkamer vir 'n tydperk van 24 uur, word dit verstaan dat van hom verwag sal word om enige waghoudiens gedurende daardie tydperk vereis, te verrig, die alarmstelsels gereeld te kontroleer, te verseker dat voldoende brandstof en smeermasjienolie beskikbaar is, na te gaan of die werkverrigting van die masjinerie bevredigend is, deur die alarm ontbied sal word indien daar enige defek ontstaan gedurende enige tydperk wat hy nie in die masjienkamer is nie, en van hom verwag sal word om enige probleem behalwe van 'n ernstige aard uit die

*Period of sea service required for the endorsement of a certificate of competency as Second Engineer-Officer (Foreign-going)*

33. A candidate for the endorsement of a certificate of competency (steam or motor) as Second Engineer-Officer (Foreign-going), shall produce proof of having performed the following period of sea service:

(a) If the motor endorsement of a certificate of competency (steam) is required, three months in addition to the sea service required in terms of regulation 32 (a): Provided that not less than nine months' service in all shall have been served on the main propelling machinery of a motorship;

(b) if the steam endorsement of a certificate of competency (motor) is required, nine months in addition to the sea service required in terms of regulation 32 (b): Provided that not less than nine months' service in all shall have been served on the boilers and main propelling machinery of a steamship. This period of at least nine months shall include at least six months' service on the boilers and six months' service on the main propelling machinery: Provided that the service on the boilers and on the main propelling machinery may have been simultaneous.

*Type of sea service required of a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) and endorsement*

34. (1) The sea service required in terms of regulations 32 and 33 of a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) and endorsement shall have been performed in a ship having a power of not less than 280 kW making short or long voyages, as an Engineer-Officer at sea on regular watch totalling at least eight hours out of every 24 hours' service claimed. Service in such a ship making long voyages shall be counted at full rate whereas service in such a ship making short voyages shall be counted at two-thirds rate.

(2) Day-work at sea carried out within the engine or boiler spaces of any ship mentioned in subregulation (1) may be accepted towards the qualifying service on regular watch referred to in that subregulation, and shall be counted at full rate up to eight months and any further periods at half rate subject to a maximum allowance of 12 months.

(3) Service in tugs, hoppers, dredgers, pilot vessels and fishing vessels having a power of not less than 280 kW may be accepted at quarter rate subject to a maximum of six months: Provided that such service shall not be counted towards the qualifying service required in regulation 33.

(4) (a) Service performed by engineer-officers employed in work practices in ships operated other than on the traditional eight hour watch routine may be accepted if the examiner is satisfied that such work practices provide a reasonably balanced system of service.

(b) When an engineer-officer, serving in a vessel having an approved operational arrangement, is nominated as being in sole charge of the machinery space for a period of 24 hours it is understood that he will be called upon to perform any watchkeeping duties required during that period, will carry out the routine checking of alarm systems, ensure that adequate fuel and lubricating oil reserves are available, check the satisfactory operation of the machinery, be called by the alarm should any fault arise at any time when he is not in the machinery spaces and

weg te ruim. Enige sodanige "tydperk van waghoudiens" word bereken teen een-en-n-half keer van die agt uit elke tydperk van 24 uur waghoudiens wat normaalweg toegelaat word.

(c) Hierdie "verantwoordelikheidstoelae" sluit in enige tydperk van kontroliering van alarmstelsels wat vereis word buite sy diensure en enige addisionele tydperke van diens deur hom verrig tydens die werkverrigting van masjinerie, byvoorbeeld, gedurende maneuvring en "gereedheid vir bystand", binnevaart of verlaten van hawe tydens kanaaldeurgang of "verskuiwing van skip".

*Kwytskelding van seediens vir 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart)*

35. 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) kan hoogstens drie maande seediens kwytsgeskel word as hy, alvorens hy met sy kwalifiserende seediens begin het, Deel A van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) deurgekom het of as hy 'n sertifikaat, diploma of graad verwerf het wat deur die Sekretaris as kwalifikasie vir algehele of gedeeltelike vrystelling van Deel A van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) erken word. 'n Lys van sertifikate, diplomas, grade of gedeeltelike grade, soos deur die Sekretaris erken, word in tabelvorm in Aanhangsel 7 uiteengesit.

#### B. KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS HOOF-INGENIEUROFFISIER (VREEMDE VAART) EN ENDOSSEMENT

*Tydperk seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart)*

36. 'n Kandidaat vir 'n sertifikaat van bekwaamheid (stoom of motor of stoom en motor) as Hoof-ingenieur-offisier (Vreemde Vaart) moet, behoudens die bepalings van regulasie 40, die houer wees van 'n geldige sertifikaat van bekwaamheid (stoom of motor of stoom en motor) as Tweede Ingenieur-offisier (Vreemde Vaart) en moet terwyl hy die houer van so 'n sertifikaat was, die tydperk toepaslike seediens voltooi het wat by regulasie 32 vereis word.

*Tydperk seediens vereis vir die endossering van 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart)*

37. 'n Kandidaat vir die endossering van 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) moet die tydperk seediens voltooi het wat by regulasie 33 vir die endossering van 'n sertifikaat van bekwaamheid (stoom of motor, na gelang van die geval) as Tweede Ingenieur-offisier (Vreemde Vaart) vereis word.

*Tipe seediens vereis van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) en Endossement*

38. (1) Die seediens wat by regulasies 36 en 37 van 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) en endossement vereis word, moet deur die kandidaat in die hoedanigheid van Ingenieur-offisier ter see op 'n skip van minstens 420 kW wat lang of kort seereise onderneem, verrig gewees het op gereelde waghoudiens van minstens agt uur uit elke 24 uur diens waarop aanspraak gemaak word.

(2) Behoudens die bepalings van subregulasie (3) moet die diens waarvan in subregulasie (1) melding gemaak word, deur die kandidaat verrig gewees het as Senior Ingenieur met bevel oor die hele wag, of as tweede in die senioriteitsvolgorde op 'n skip aangedryf deur twee

be expected to rectify any but a major fault. Any such "watchkeeping period" will be assessed at a rate of one and a half times the normal eight-hour watchkeeping allowance for each 24 hour period.

(c) This "responsibility allowance" takes into account any period of checking alarm systems required outside his hours of duty below and any additional engine operation periods performed, for example, during manoeuvring and "stand by", entering or leaving port, on canal passage or "shifting ship".

*Remission of sea service for a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going)*

35. A candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) who, before commencing his qualifying sea service, has passed Part A of the examination for a certificate of competency as Second Engineer-Officer (Foreign-going) or who has obtained a certificate, diploma or degree recognised by the Secretary as conferring full or partial exemption from Part A of the examination for a certificate of competency as Second Engineer-Officer (Foreign-going), may be granted a remission of sea service not exceeding three months. A list of certificates, diplomas, degrees or partial degrees recognised by the Secretary is tabulated in Annex 7.

#### B. CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS CHIEF ENGINEER-OFFICER (FOREIGN-GOING) AND ENDORSEMENT

*Period of sea service required of a candidate for a certificate of competency as Chief Engineer-Officer (Foreign-going)*

36. A candidate for a certificate of competency (steam, motor or combined steam and motor) as Chief Engineer-Officer (Foreign-going) shall, subject to the provisions of regulation 40, hold a valid certificate of competency (steam, motor or combined steam and motor) as Second Engineer-Officer (Foreign-going) and, whilst holding such a certificate, shall have completed the period of appropriate sea service required in terms of regulation 32.

*Period of sea service required for the endorsement of a certificate of competency as Chief Engineer-Officer (Foreign-going)*

37. A candidate for the endorsement of a certificate of competency as Chief Engineer-Officer (Foreign-going) shall have completed the period of sea service required in terms of regulation 33 for the endorsement of a certificate of competency (steam or motor, as the case may be) as Second Engineer-Officer (Foreign-going).

*Type of sea service required of a candidate for a certificate of competency as Chief Engineer-Officer (Foreign-going) and endorsement*

38. (1) The sea service required in terms of regulations 36 and 37 of a candidate for a certificate of competency as Chief Engineer-Officer (Foreign-going) and endorsement shall have been performed in a ship having a power of not less than 420 kW making long or short voyages, as an engineer-officer at sea on regular watch for not less than eight hours out of every 24 hours' service claimed.

(2) Subject to the provisions of subregulation (3), the service referred to in subregulation (1) shall have been performed as senior engineer in charge of the entire watch, or as second in seniority in a ship propelled by



of meer stelle masjiene of op 'n groot eenskroefskip waar daar terselfdertyd drie of meer Ingenieur-offisiere op gereelde waghoudiens is. Waar sodanige diens aldus verrig word op 'n skip wat lang seereise onderneem, tel alles, maar van sulke diens op 'n skip wat kort seereise onderneem, tel net twee-derdes.

(3) Die diens waarvan in subregulasie (1) melding gemaak word, kan ook in die geval van 'n skip aangedryf deur twee of meer stelle masjiene of op 'n groot eenskroefskip verrig gewees het in range laer as die wat in subregulasie (2) vermeld word. As hierdie diens aldus verrig is op 'n skip wat lang seereise onderneem, tel net die helfte daarvan, en as dit aldus verrig is op 'n skip wat kort seereise onderneem, tel net 'n kwart daarvan.

(4) Van diens op sleepbote, modderskuite, baggerskepe, loodsbote en vissersbote van minstens 420 kW tel 'n kwart, onderworpe aan 'n maksimum van ses maande: Met dien verstande dat sodanige diens nie as kwalifiserende diens soos vereis by regulasie 37, gelees met regulasie 33, mag tel nie.

(5) Deeltydse diens wat deur Ingenieur-offisiere by werkverrigting van masjinerie sonder toesig verrig word, kan aanvaar word indien die eksaminator daarvan oortuig is dat sodanige diens voorsiening maak vir 'n redelik gebalanseerde stelsel van diens. Diens wat deur hierdie subregulasie omvat word, sal op dieselfde wyse bereken word as bepaal ingevolge regulasie 34 (4).

*Kwytstelling van seediens vir 'n kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart)*

39. 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Hoofingenieur-offisier (Vreemde Vaart) kan hoogstens drie maande seediens kwytgeskeld word as hy, alvorens hy met sy kwalifiserende seediens begin het, Deel A van die eksamen vir 'n sertifikaat van bekwaamheid as Hoofingenieur-offisier (Vreemde Vaart) deurgekom het of as hy 'n sertifikaat, diploma of graad verwerf het wat deur die Sekretaris as kwalifikasie vir algehele of gedeeltelike vrystelling van Deel A van die eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) erken word. 'n Lys van sertifikate, diplomas, grade of gedeeltelike grade, soos deur die Sekretaris erken, word in tabelvorm in Aanhangsel 7 uiteengesit.

*Eksamen vir 'n sertifikaat van bekwaamheid as Hoofingenieur-offisier (Vreemde Vaart) sonder dat 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) voorgelê word*

40. (1) 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) wat weens diens in die buiteland geen geleentheid gehad het om 'n geldige sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) te verwerf nie, kan behoudens die bepalinge van subregulasie (2) tot die eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) toegelaat word: Met dien verstande dat die Sekretaris daarvan oortuig is dat die kandidaat se diens, vakleerlingskap of tegniese studies, met inbegrip van werkwinkeldiens, nie van 'n laer gehalte is as wat vir die toekenning van 'n sertifikaat van bekwaamheid as Hoofingenieur-offisier (Vreemde Vaart) kragtens hierdie regulasies vereis word nie.

(2) 'n Kandidaat vermeld in subregulasie (1) moet bewys lewer dat hy minstens vier jaar op 'n stoomskip of motorskip van minstens 420 kW wat lang seereise onderneem, diens gedoen het, van welke tydperk hy minstens 18 maande lank beheer oor die hele waghoudiens by die ketels en hoofaandrywingsmasjinerie van 'n stoomskip of by die hoofaandrywingsmasjinerie van 'n motorskip moet gehad het, en hy moet slaag in die eksamen in Wiskunde en Tekene wat by regulasie 52 (2) (c) en (d) voorgeskryf word.

two or more sets of engines or in a large single screw ship where there are three or more engineer-officers on regular watch at the same time. Such service so performed in a ship making long voyages shall be counted at full rate, whereas such service so performed in a ship making short voyages shall be counted at two-thirds rate.

(3) The service referred to in subregulation (1) may also have been performed in ranks below those mentioned in subregulation (2) in a ship propelled by two or more sets of engines or in a large single screw ship. This service so performed in a ship making long voyages shall be counted at half rate, whereas such service so performed in a ship making short voyages shall be counted at quarter rate.

(4) Service in tugs, hoppers, dredgers, pilot vessels and fishing vessels of not less than 420 kW may be accepted at quarter rate subject to a maximum of six months: Provided that such service shall not be counted towards the qualifying service required in regulation 37 read with regulation 33.

(5) Part-time service performed by engineer-officers in unattended machinery space operation may be accepted if the examiner is satisfied that such service provides a reasonably balanced system of service. Service falling within the scope of this subregulation will be assessed in similar manner to that laid down in regulation 34 (4).

*Remission of sea service for a candidate for a certificate of competency as Chief Engineer-Officer (Foreign-going)*

39. A candidate for a certificate of competency as Chief Engineer-Officer (Foreign-going) who, before commencing his qualifying sea service, has passed Part A of the examination for a certificate of competency as Chief Engineer-Officer (Foreign-going) or who has obtained a certificate, diploma or degree recognised by the Secretary as conferring full or partial exemption from Part A of the examination for a certificate of competency as Chief Engineer-Officer (Foreign-going), may be granted a remission of sea service not exceeding three months. A list of certificates, diplomas, degrees or partial degrees recognised by the Secretary is tabulated in Annex 7.

*Examination for a certificate of competency as Chief Engineer-Officer (Foreign-going) without production of a certificate of competency as Second Engineer-Officer (Foreign-going)*

40. (1) A candidate for a certificate of competency as Chief Engineer-Officer (Foreign-going) who, in consequence of service abroad, has had no opportunity to obtain a valid certificate of competency as Second Engineer-Officer (Foreign-going) may, subject to the provisions of subregulation (2), be admitted to the examination for a certificate of competency as Chief Engineer-Officer (Foreign-going): Provided the Secretary is satisfied that the character of the candidate's service, apprenticeship or technical studies, including workshop service, is of a standard not lower than that required for the grant under these regulations of a certificate of competency as Chief Engineer-Officer (Foreign-going).

(2) A candidate referred to in subregulation (1) shall produce proof of having served for at least four years in a steamship or motorship having a power of not less than 420 kW making long voyages, of which at least 18 months shall have been spent in charge of the entire watch on the boilers and main propelling machinery of a steamship or on the main propelling machinery of a motorship, and shall pass the examination in Mathematics and Drawing prescribed in regulation 52 (2) (c) and (d).

(3) Indien 'n kandidaat wat in subregulasie (1) vermeld word, nie in die eksamen vir die sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) slaag nie, maar toon dat hy die standaard bereik het wat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) vereis word, kan die Minister so 'n sertifikaat aan hom toeken: Met dien verstande dat geen deel van die eksamengeld aan hom terugbetaal word nie.

#### HOOFSTUK IV

#### KWALIFIKASIES VEREIS VAN 'N KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS HOOF-INGENIEUROFFISIER—SPESIALE GRAAD

##### *Algemeen*

41. (1) 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier—Spesiale Graad moet die houer wees van of 'n geldige gekombineerde sertifikaat van bekwaamheid (stoom en motor) as Hoof-ingenieur-offisier (Vreemde Vaart) of 'n geldige sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) ten opsigte van die een aandryfkrag geëndosseer vir die ander.

(2) Geen seediens word van die kandidaat vereis benewens die diens wat hy vir sy sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Vreemde Vaart) of endosement verrig het nie.

(3) Aan daardie kandidate wat behalwe 'n geldige sertifikaat van bekwaamheid as Hoof-ingenieur-offisier van stoom- en motorskepe op vreemde vaart, ook grade in meganiese of skeepsingenieurswese of die Suid-Afrikaanse Hoër Nasionale Diploma verwerf het of wat as lede verbonde is aan institute vir meganiese ingenieurswese deurdat in die eksamens van daardie institute geslaag is, kan vrystelling van die eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier—Spesiale Graad op 'n vak-tot-vak-grondslag verleen word.

#### HOOFSTUK V

#### ALGEMENE BEPALINGS BETREFFENDE AANVAARBAARHEID (NIE OP 'N KANDIDAAT VIR 'N SERTIFIKAAT VAN BEKWAAMHEID AS HOOF-INGENIEUROFFISIER—SPESIALE GRAAD VAN TOEPASSING NIE)

##### *Algemeen*

42. (1) Die las om aanvaarbare bewys van seediens te lewer, rus in alle gevalle op die kandidaat wat op sodanige diens aanspraak maak.

(2) As 'n kandidaat op seediens op 'n skip wat nie in die Republiek geregistreer is nie aanspraak maak en sodanige diens nie deur die Sekretaris geverifieer kan word nie, moet die diens bevestig word deur 'n amptelike owerheid van die land waaraan die skip behoort het waarop die kandidaat gedien het. As daar enigins getwyfel word aan die afdoendheid van die gelewerde bewyse, moet alle dokumente met die oog op beslissing na die Sekretaris verwys word.

(3) Alleen seediens—

- (a) ingevolge 'n ooreenkoms met die bemanning; of
- (b) gestaaf deur 'n sertifikaat van seediens verstrekk deur die bestuurder of eienaar van 'n skip genoem in 'n kennisgewing uitgereik ooreenkomstig artikel 3 (3) van die Wet;

word as seediens gereken.

(4) Indien 'n deel van of al die kwalifiserende diens deur 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) of Hoof-ingenieur-offisier (Vreemde Vaart) verrig is op 'n skip wat oor aansienlike tydperke nie ter see was nie, moet die kandidaat 'n sertifikaat van die eienaar van die skip voorlê waarin gemeld word watter deel van die tyd werklik

(3) If a candidate referred to in subregulation (1) fails to pass the examination for a certificate of competency as Chief Engineer-Officer (Foreign-going) but shows that he has reached the standard required for a certificate of competency as Second Engineer-Officer (Foreign-going) the Minister may grant him such a certificate: Provided that no part of the examination fee shall be refunded to him.

#### CHAPTER IV

#### QUALIFICATIONS REQUIRED OF A CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS CHIEF ENGINEER-OFFICER—SPECIAL GRADE

##### *General*

41. (1) A candidate for a certificate of competency as Chief Engineer-Officer—Special Grade shall hold either a valid combined certificate of competency (steam and motor) as Chief Engineer-Officer (Foreign-going) or a valid certificate of competency as Chief Engineer-Officer (Foreign-going) for the one motive power endorsed for the other.

(2) Sea service additional to the service which he performed for his certificate of competency as Chief Engineer-Officer (Foreign-going) or endorsement, shall not be required of the candidate.

(3) Those candidates who, in addition to holding a valid certificate of competency as Chief Engineer-Officer of foreign-going steamships and motorships, also hold degrees in mechanical or marine engineering, or the South African Higher National Diploma or are corporate members of mechanical engineering institutions by virtue of passing the examinations of those institutions, may be granted exemption on a subject-for-subject basis from the examination for a certificate of competency as Chief Engineer-Officer—Special Grade.

#### CHAPTER V

#### GENERAL PROVISIONS AS TO ELIGIBILITY (NOT APPLICABLE TO A CANDIDATE FOR A CERTIFICATE OF COMPETENCY AS CHIEF ENGINEER-OFFICER—SPECIAL GRADE)

##### *General*

42. (1) In all cases the onus of producing acceptable proof of sea service shall rest upon the candidate claiming such service.

(2) Where a candidate claims sea service performed in a ship not registered in the Republic and such service cannot be verified by the Secretary, the service shall be confirmed by an official authority of the country to which the ship in which the candidate served, belonged. If the sufficiency of the proof given appears to be at all doubtful, all papers shall be referred to the Secretary for decision.

(3) Only sea service—

- (a) performed in terms of an agreement with the crew; or
- (b) proved by a certificate of sea service furnished by the manager or owner of any ship named in a notice issued in terms of section 3 (3) of the Act;

shall be reckoned as sea service.

(4) When part or whole of the qualifying service has been performed by a candidate for a certificate of competency as Second Engineer-Officer (Foreign-going) or Chief Engineer-Officer (Foreign-going) in a ship which for considerable periods has not been at sea, the candidate shall produce a certificate from the owner of the ship stating the proportion of time actually spent at sea. If this



ter see deurgebring is. As hierdie tyd minstens tweederdes bedra van die seediens wat nodig is om vir die eksamen te kwalifiseer, kan al die diens aanvaar word, maar as die werklike diens ter see minder as sodanige deel is, moet die kandidaat die tekort aanvul deur addisionele seediens te verrig.

(5) Diens op 'n skip waar 'n waghoudende Ingenieur-offisier as deel van sy gereelde pligte stook- of ander werk moet verrig wat nie gewoonlik deur 'n Ingenieur-offisier gedoen word nie, word nie as kwalifiserende diens aanvaar nie.

(6) In die geval van diens waarvoor nie in hierdie regulasies voorsiening gemaak word nie, moet die Sekretaris beslis of sodanige diens as kwalifiserende diens aanvaar kan word.

#### *Hoe seediens bereken word*

43. Die kandidaat se seediens word bereken volgens kalendermaande, d.w.s. die tyd tussen enige bepaalde dag in 'n maand en die voorafgaande dag van die volgende maand, albei inbegrepe. Die getal volle maande vanaf die begin van die tydperk wat aldus vasgestel is, word bereken en daarna word die getal los dae getel. Die dag waarop die ooreenkoms in werking tree en die dag waarop dit eindig, word albei ingesluit en al die los dae word bymekaar getel en teen 30 dae per maand bereken.

#### *Diens by hulpmasjiene*

44. (1) Behoudens die bepalings van regulasies 17 en 32 betreffende die minimum diens by ketels en hoofmasjiene tel diens by hulpmasjinerie wat saam met die hoofaandrywingsmasjinerie gebruik word (d.w.s. by hulpmasjiene wat vir die werking van die hoofaandrywingsmasjinerie of ketels noodsaaklik is) alles in mindering van die kwalifiserende tydperk seediens.

(2) Van diens by geskikte hulpmasjiene wat onafhanklik van die hoofaandrywingsmasjinerie gebruik word, tel net die helfte.

### HOOFSTUK VI

#### EKSAMENGELDE (ALLE KANDIDATE)

##### *Wanneer om gelde te betaal*

45. (1) 'n Kandidaat wat 'n eksamen vir 'n bekwaamheidsertifikaat wil aflê, moet ten minste twee weke voor die datum van die eksamen 'n aansoekvorm in tweevoud invul. Geen kandidaat mag toegelaat word om eksamen af te lê nie, tensy hy die kwitansie vir die betaalde eksamengeld aan die eksaminator toon.

(2) 'n Kandidaat wat aansoek doen vir vrystelling van 'n deel van die eksamen vir enige graad van 'n sertifikaat van bekwaamheid, moet 'n aansoekvorm in tweevoud invul, die voorgeskrewe gelde vir dié deel van die eksamen waarvoor hy vrystelling verlang, betaal en die oorspronklike asook twee afskrifte van sy vrystellingskwalifikasies voorlê.

##### *Waar om gelde te betaal*

46. Die eksamengeld moet aan die naaste bevoegde beamppte betaal word en dié moet 'n kwitansie uitreik waarop vermeld word—

- (a) die naam van die kandidaat;
- (b) die betaalde bedrag; en
- (c) die graad van die eksamen.

##### *Tabel van eksamengelde*

47. (1) Die betaalbare eksamengelde is as volg:

(a) Eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) of endorsement:

|                                                                                | R    |
|--------------------------------------------------------------------------------|------|
| (i) Die volle eksamen vir 'n sertifikaat (stoom, motor of stoom en motor)..... | 8,00 |
| (ii) Deel van die eksamen.....                                                 | 4,00 |
| (iii) Eksamen vir endorsement (stoom of motor).....                            | 4,00 |

time amounts to not less than two-thirds of the sea service required to qualify for the examination, the service may be accepted in full, but where the actual service at sea falls below this proportion, the candidate shall be required to make up the deficiency by performing additional sea service.

(5) Service in a ship where a watchkeeping Engineer-Officer is, as part of his regular duties, required to do stoking or other work not usually performed by an Engineer-Officer, shall not be accepted as qualifying service.

(6) The acceptance as qualifying service, of service which is not provided for in these regulations, shall be decided by the Secretary.

#### *How sea service is calculated*

43. The candidate's sea service shall be reckoned by the calendar month, i.e. the time between any given day in any months and the preceding day of the following month, both inclusive. The number of complete months from the commencement of the period, ascertained in this way, shall be computed, after which the number of odd days shall be counted. The day on which the agreement commences, as well as that on which it terminates, shall both be included, and all odd days added together and reckoned at 30 days to the month.

#### *Service on auxiliary machinery*

44. (1) Time served on auxiliary machinery run in conjunction with the main propelling machinery (i.e. on auxiliaries which are essential to the running of the main propelling machinery or boilers) shall, subject to the provisions regarding the minimum service on boilers and main engines set out in regulations 17 and 32, count in full towards the qualifying period of sea service.

(2) Time served on suitable auxiliaries run independently of the main propelling machinery shall count at half rate.

### CHAPTER VI

#### EXAMINATION FEES (ALL CANDIDATES)

##### *When to pay fees*

45. (1) A candidate for the examination for a certificate of competency shall complete an application form in duplicate at least two weeks prior to the date of examination. No candidate shall be allowed to sit for the examination unless he produces to the examiner the receipt for the fee paid.

(2) A candidate who applies for exemption from part of the examination for any grade of certificate of competency shall complete an application form in duplicate, pay the fee prescribed for that part of the examination from which he seeks exemption and submit the original and two copies of his exempting qualifications.

##### *Where to pay fees*

46. The fee for examination shall be paid to the nearest proper officer who shall issue a receipt stating—

- (a) the name of the candidate;
- (b) the amount paid; and
- (c) the grade of the examination.

##### *Table of examination fees*

47. (1) The fees payable shall be as follows:

(a) Examination for a certificate of competency as Second Engineer-Officer (Coasting) or endorsement:

|                                                                                            | R    |
|--------------------------------------------------------------------------------------------|------|
| (i) The full examination for a certificate (steam, motor or combined steam and motor)..... | 8,00 |
| (ii) Part of the examination.....                                                          | 4,00 |
| (iii) The endorsement (steam or motor) examination....                                     | 4,00 |

(b) Eksamen vir 'n sertifikaat van bekwaamheid as Hoofingenieur-offisier (Kusvaart) of endossement:

R

- |                                                                                |       |
|--------------------------------------------------------------------------------|-------|
| (i) Die volle eksamen vir 'n sertifikaat (stoom, motor of stoom en motor)..... | 12,00 |
| (ii) Deel van die eksamen.....                                                 | 6,00  |
| (iii) Eksamen vir endossement (stoom of motor).....                            | 6,00  |

(c) Eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) of endossement:

R

- |                                                                                |       |
|--------------------------------------------------------------------------------|-------|
| (i) Die volle eksamen vir 'n sertifikaat (stoom, motor of stoom en motor)..... | 18,00 |
| (ii) Deel A of Deel B of 'n gedeelte van een van hierdie dele.....             | 9,00  |
| (iii) Eksamen vir endossement (stoom of motor).....                            | 9,00  |

(d) Eksamen vir 'n sertifikaat van bekwaamheid as Hoofingenieur-offisier (Vreemde Vaart) of endossement:

R

- |                                                                                |       |
|--------------------------------------------------------------------------------|-------|
| (i) Die volle eksamen vir 'n sertifikaat (stoom, motor of stoom en motor)..... | 28,00 |
| (ii) Deel A of Deel B of 'n gedeelte van enige deel.....                       | 14,00 |
| (iii) Eksamen vir endossement (stoom of motor).....                            | 14,00 |

(e) Eksamen vir 'n sertifikaat van bekwaamheid as Hoofingenieur-offisier—Spesiale Graad:

R

- |                                               |       |
|-----------------------------------------------|-------|
| (i) Die volle eksamen vir 'n sertifikaat..... | 36,00 |
| (ii) Deel A of Deel B.....                    | 18,00 |

(2) 'n Bedrag van R6 is betaalbaar vir die uitreiking van 'n dienssertifikaat.

(3) 'n Bedrag van R2 is betaalbaar vir 'n gewaarmerkte afskrif van 'n verlore bekwaamheid- of dienssertifikaat: Met dien verstande dat geen bedrag betaalbaar is indien die sertifikaat as gevolg van skipbreuk of brand aan boord van die skip verlore gegaan het nie.

#### *Terugbetaling van eksamengelde*

48. (1) Indien 'n kandidaat weens omstandighede buite sy beheer nie in staat is om die eksamen af te lê waarvoor hy eksamengeld betaal het nie, kan hy skriftelik by die bevoegde beampte om terugbetaling van sodanige eksamengeld aansoek doen. Indien die bevoegde beampte van mening is dat die aansoek op redelike gronde berus, moet hy die aansoek deurstuur aan die Sekretaris, wat die terugbetaling kan magtig.

(2) Indien 'n kandidaat nie 'n eksamen ooreenkomstig regulasie 8 voltooi nie, kan hy skriftelik by die bevoegde beampte aansoek doen om terugbetaling van die eksamengeld wat deur hom betaal is, en sodanige geld moet aan hom terugbetaal word.

(3) Indien 'n kandidaat in enige deel van die eksamen druipt, word behoudens die bepalinge van subregulasie (2) geen deel van die eksamengeld aan hom terugbetaal nie.

(4) Indien die aansoek om 'n dienssertifikaat misluk, word die bedrag wat deur die applikant betaal is, aan hom terugbetaal.

#### HOOFSTUK VII

EKSAMENS: SERTIFIKAAT VAN BEKWAAMHEID AS TWEDE INGENIEUROFFISIER (KUSVAART) EN ENDOSSEMENT, OF HOOF-INGENIEUROFFISIER (KUSVAART) EN ENDOSSEMENT

##### *Ingenieur-offisier (Kusvaart) of Hoofingenieur-offisier (Kusvaart)*

49. (1) Die leerplanne vir die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) of Hoofingenieur-offisier (Kusvaart) word in Aanhangsel 2 uiteengesit.

(b) Examination for a certificate of competency as Chief Engineer-Officer (Coasting) or endorsement:

R

- |                                                                                            |       |
|--------------------------------------------------------------------------------------------|-------|
| (i) The full examination for a certificate (steam, motor or combined steam and motor)..... | 12,00 |
| (ii) Part of the examination.....                                                          | 6,00  |
| (iii) The endorsement (steam or motor) examination...                                      | 6,00  |

(c) Examination for a certificate of competency as Second Engineer-Officer (Foreign-going) or endorsement:

R

- |                                                                                            |       |
|--------------------------------------------------------------------------------------------|-------|
| (i) The full examination for a certificate (steam, motor or combined steam and motor)..... | 18,00 |
| (ii) Part A or Part B or a portion of either Part.....                                     | 9,00  |
| (iii) The endorsement (steam or motor) examination...                                      | 9,00  |

(d) Examination for a certificate of competency as Chief Engineer-Officer (Foreign-going) or endorsement:

R

- |                                                                                            |       |
|--------------------------------------------------------------------------------------------|-------|
| (i) The full examination for a certificate (steam, motor or combined steam and motor)..... | 28,00 |
| (ii) Part A or Part B or a portion of either Part.....                                     | 14,00 |
| (iii) The endorsement (steam or motor) examination...                                      | 14,00 |

(e) Examination for a certificate of competency as Chief Engineer-Officer—Special Grade:

R

- |                                                 |       |
|-------------------------------------------------|-------|
| (i) The full examination for a certificate..... | 36,00 |
| (ii) Part A or Part B.....                      | 18,00 |

(2) A fee of R6 shall be paid for the issue of a certificate of service.

(3) A fee of R2 shall be paid for a certified copy of a lost certificate of competency or service: Provided that no fee shall be paid if the certificate was lost through shipwreck or fire on board ship.

#### *Refund of examination fees*

48. (1) If through circumstances beyond the control of a candidate he is unable to undergo the examination for which a fee has been paid, he may apply in writing to the proper officer for a refund of such fee. If the proper officer considers that the application is based upon reasonable grounds, he shall transmit it to the Secretary, who may authorise the refund.

(2) If a candidate does not, in terms of regulation 8 complete an examination, he may apply in writing to the proper officer for a refund of the fee paid by him, and such fee shall be refunded to him.

(3) Subject to the provisions of subregulation (2), if a candidate fails to pass any part of the examination, no part of the fee shall be refunded to him.

(4) If the application for a certificate of service is unsuccessful, the fee paid by the applicant shall be refunded to him.

#### CHAPTER VII

EXAMINATIONS: CERTIFICATE OF COMPETENCY AS SECOND ENGINEER-OFFICER (COASTING) AND ENDORSEMENT, OR CHIEF ENGINEER-OFFICER (COASTING) AND ENDORSEMENT

*Examination for a certificate of competency as Second Engineer-Officer (Coasting) or Chief Engineer-Officer (Coasting)*

49. (1) The syllabuses for the examination for a certificate of competency as Second Engineer-Officer (Coasting) or Chief Engineer-Officer (Coasting) are set out in Annex 2.



(2) Die eksamen moet die volgende dek:

- (a) Algemene Ingenieurswetenskap (1 vraestel van 3 uur).
- (b) Hitte en Hittewerktuie (1 vraestel van 3 uur).
- (c) (i) Ingenieurswese (twee vraestelle van 3 uur elk).
- (ii) Mondelinge eksamen.

(3) 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) kan hom te eniger tyd tussen voltooiing van sy werkweekdiens en voltooiing van sy kwalifiserende seediens aanmeld om in die vakke Algemene Ingenieurswetenskap, en Hitte en Hittewerktuie geëksamineer te word.

(4) 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier (Kusvaart) kan hom te eniger tyd na slaging in die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) aanmeld om in die vakke Algemene Ingenieurswetenskap, en Hitte en Hittewerktuie geëksamineer te word.

(5) 'n Kandidaat wat in een of twee vakke slaag, hoef nie daardie vakke weer te neem nie en kan hom behoudens die bepalings van regulasie 57 aanmeld om in die oorblywende vak of vakke hereksamineer te word.

*Eksamen vir endossering van 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) of Hoof-ingenieur-offisier (Kusvaart)*

50. Die eksamen vir die endossering van 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) of Hoof-ingenieur-offisier (Kusvaart) moet uit die volgende bestaan:

- (a) Een skriftelike vraestel van 3 uur in Ingenieurswese;
- (b) mondelinge eksamen.

Die leerplanne vir hierdie eksamens word in Aanhangsel 2 uiteengesit.

#### *Punte vereis vir slaging*

51. (1) Ten einde in die skriftelike deel van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart) en endossering of Hoofingenieur-offisier (Kusvaart) en endossering te slaag, moet 'n kandidaat vir elke vak 'n minimum puntetal en ook vir al die vakke saam minstens die helfte van die totale puntetal behaal. In die mondelinge eksamen word 'n hoër standaard vereis.

(2) Die uitslag van die eksamen sal deur die eksaminator aan die kandidaat meegedeel word.

### HOOFSTUK VIII

**EKSAMENS: SERTIFIKAAT VAN BEKWAAMHEID AS TWEDE INGENIEUROFFISIER (VREEMDE VAART) EN ENDOSSEMENT, OF HOOF-INGENIEUROFFISIER (VREEMDE VAART) EN ENDOSSEMENT**

*Eksamen vir sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart)*

52. (1) Die leerplanne vir die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) word in Aanhangsel 3 uiteengesit.

(2) Die eksamen word in twee dele verdeel, as volg:

#### **Deel A**

- (a) Toegepaste Meganika (1 vraestel van 3 uur).
- (b) Hitte en Hittewerktuie (1 vraestel van 3 uur).
- (c) Wiskunde (1 vraestel van 3 uur).
- (d) Tekene (1 vraestel van 6 uur).

(2) The examination shall cover—

- (a) General Engineering Science (1 paper of 3 hours).
- (b) Heat and Heat Engines (1 paper of 3 hours).
- (c) (i) Engineering Knowledge (2 papers, each of 3 hours).
- (ii) Oral.

(3) A candidate for a certificate of competency as Second Engineer-Officer (Coasting) may present himself for examination in the subjects "General Engineering Science" and "Heat and Heat Engines" at any time between the completion of his workshop service and the completion of his qualifying sea service.

(4) A candidate for a certificate of competency as Chief Engineer-Officer (Coasting) may present himself for examination in the subjects "General Engineering Science" and "Heat and Heat Engines" at any time after he has passed the examination for a certificate of competency as Second Engineer-Officer (Coasting).

(5) A candidate who passes in one or two subjects shall not be required to take those subjects again and, subject to the provisions of regulation 57, may present himself for re-examination in the remaining subject or subjects.

*Examination for endorsement of a certificate of competency as Second Engineer-Officer (Coasting) or Chief Engineer-Officer (Coasting)*

50. The examination for the endorsement of a certificate of competency as Second Engineer-Officer (Coasting) or Chief Engineer-Officer (Coasting) shall consist of—

- (a) one written paper of 3 hours in Engineering Knowledge;
- (b) oral.

The syllabuses for these examinations are set out in Annex 2.

#### *Marks required for pass*

51. (1) To secure a pass in the written portion of the examination for a certificate of competency as Second Engineer-Officer (Coasting) and endorsement of Chief Engineer-Officer (Coasting) and endorsement, a candidate shall be required to obtain a minimum number of marks in each subject and also to obtain not less than one-half of the total number of marks for all subjects. In the oral examination a higher standard will be required.

(2) The result of the examination will be communicated to the candidate by the examiner.

### CHAPTER VIII

**EXAMINATIONS: CERTIFICATE OF COMPETENCY AS SECOND ENGINEER-OFFICER (FOREIGN-GOING) AND ENDORSEMENT, OR CHIEF ENGINEER-OFFICER (FOREIGN-GOING) AND ENDORSEMENT**

*Examination for a certificate of competency as Second Engineer-officer (Foreign-going)*

52. (1) The syllabuses for the examination for a certificate of competency as Second Engineer-Officer (Foreign-going) are set out in Annex 3.

(2) The examination is divided into two parts, as follows:

#### **Part A**

- (a) Applied Mechanics (1 paper of 3 hours).
- (b) Heat and Heat Engines (1 paper of 3 hours).
- (c) Mathematics (1 paper of 3 hours).
- (d) Drawing (1 paper of 6 hours).

## Deel B

- (a) (i) Elektrotegnologie (1 vraestel van 3 uur).
- (ii) Elementêre Skeepsboukunde (1 vraestel van 3 uur).
- (b) (i) Ingenieurswese (2 vraestelle van 3 uur elk).
- (ii) 'n Mondelinge eksamen.

(3) 'n Kandidaat kan, behoudens 'n minimum van twee vakke, vrygestel word van die hele of 'n deel van Deel A en kan die eksamen in afsonderlike dele aflê, as volg:

(a) As 'n kandidaat 'n goedgekeurde onderrigkursus wat minstens twee uit die vier vakke inbegrepe in Deel A dek, gevolg en 'n sertifikaat verwerf het of 'n verklaring wat meld hoe ver hy in die kursus gevorder het, word hy vrygestel van die vakke in Deel A indien aan die vereiste standaard soos uiteengesit in die Aanhangsel van hierdie regulasies, voldoen is. Die volgende kwalifikasies vir werktuigkundige-, elektriese of skeepsingenieurswese kan volgens die nuwe stelsel vir tegniese onderrig aanvaar word ten einde aan die kandidaat vrystelling van Deel A van die eksamen vir Tweede Ingenieur-offisier (Vreemde Vaart) op 'n vak-vir-vak-grondslag te verleen:

- (i) Die Nasionale Tegniese Diploma (Werktuigkundige, skeepsingenieurswese).
- (ii) Die Nasionale Intermediêre Tegniese Diploma asook 'n verklaring dat vier vakke van T3 suksesvol afgelê is.
- (iii) Die voltooiing deur 'n universiteitsstudent van al die tweedejaarskursusse van 'n Baccalaureusgraad in Werktuigkundige, Skeeps- of Elektriese Ingenieurswese.

Ondergenoemde kwalifikasies wat verwerf is onder die ou tegniese opleidingskema word steeds erken:

- (i) Die Nasionale Tegniese Sertifikaat Deel V (voorheen bekend as G.T.S. II).
- (ii) Die Nasionale Tegniese Diploma (voorheen bekend as die Nasionale Diploma in Ingenieurswese).

(b) 'n Kandidaat kan hom te eniger tyd na voltooiing van die nodige werkwinkeldiens of vir die hele Deel A van die eksamen of, indien kragtens paragraaf (a) gedeeltelike vrystelling aan hom verleen is, vir die oorblywende vak of vakke aanmeld.

(c) 'n Kandidaat wat nie geheel en al of gedeeltelik kragtens paragraaf (a) vrygestel is nie en wat net een vak deurkom wanneer hy Deel A van die eksamen aandurf, moet by hereksaminering weer die hele Deel A aflê. As hy in twee of drie vakke slaag, hoef hy nie daardie vakke te herhaal nie en kan hy hom behoudens die bepalinge van regulasie 57 vir hereksamen in die oorblywende vak of vakke aanmeld.

(d) 'n Kandidaat kan Deel B te eniger tyd na voltooiing van die nodige tydperke kwalifiserende werkwinkel- en seediens aflê: Met dien verstande dat hy ook terselfdertyd die hele Deel A van die eksamen aflê of eksamen doen in die vakke (as daar is) van daardie deel waarin hy nie reeds geslaag het of waarvan hy nie kragtens paragraaf (a) vrygestel is nie.

(e) 'n Kandidaat mag nie 'n slaagpunt in Deel B of in enige afdeling van Deel B gegee word nie tensy hy Deel A terselfdertyd as Deel B voltooi of reeds tevore voltooi het of daarvan vrygestel is.

(f) 'n Kandidaat wat Deel A voltooi of voltooi het en wanneer hy Deel B van die eksamen aflê, in afdeling (a) (Elektrotegnologie en Elementêre Skeepsboukunde) slaag maar in afdeling (b) (Ingenieurswese en Mondeling) druipt, moet 'n slaagpunt vir afdeling (a) gegee word en kan behoudens die bepalinge van regulasie 57 'n hereksamen in afdeling (b) aflê.

(g) 'n Kandidaat wat Deel A voltooi of voltooi het en wanneer hy Deel B van die eksamen aflê, in afdeling (b) (Ingenieurswese en Mondeling) slaag maar in afdeling (a)

## PART B

- (a) (i) Electrotechnology (1 paper of 3 hours).
- (ii) Elementary Naval Architecture (1 paper of 3 hours).
- (b) (i) Engineering Knowledge (2 papers, each of 3 hours).
- (ii) Oral.

(3) A candidate may be exempted from Part A or a portion of it, subject to a minimum of two subjects, and may take the examination in separate parts, as follows:

(a) A candidate who has attended an approved course of instruction which covers not less than two of the four subjects included in Part A, and who has obtained a certificate or a statement indicating what level of the course he has reached, shall be granted exemption from the subjects in Part A if the requisite level as tabulated in the annex to these regulations has been reached. Under the new technical training system the following qualifications in mechanical, electrical or marine engineering may be accepted as Part A exemptions on a subject-for-subject basis for the examination for Second Engineer-Officer (Foreign-going) only:

- (i) The National Certificate for Technicians (Mechanical, Marine Engineering).
- (ii) The National Intermediate Diploma for Technicians plus a statement that four T.3 subjects have been passed.
- (iii) The completion by a university student of all the courses for the second year of a Bachelor of Science course in Mechanical, Marine or Electrical Engineering.

The under-mentioned qualifications gained under the old technical training scheme will continue to be recognised:

- (i) The National Technical Certificate Part V (previously known as A.T.C. II).
- (ii) The National Technical Diploma (previously known as the National Engineering Diploma).

(b) A candidate may present himself either for the whole of Part A of the examination, or, if he has been granted partial exemption under paragraph (a), for the remaining subject or subjects at any time after he has completed the necessary workshop service.

(c) A candidate who has not been exempted wholly or partially under paragraph (a) and who, when attempting Part A of the examination, passes in one subject only, must take the whole of Part A again on re-examination. If he passes in two or three subjects, he shall not be required to take those subjects again and, subject to the provisions of regulation 57, may present himself for re-examination in the remaining subject or subjects.

(d) A candidate may take Part B at any time after he has completed the necessary periods of qualifying workshop and sea service: Provided he also takes at the same time the whole of Part A of the examination or such subjects, if any, in that part in which he has not already passed or from which he has not been exempted under paragraph (a).

(e) A candidate shall not be given a pass in Part B or in either section of Part B unless he completes Part A at the same time as Part B or unless he has previously completed it, or has been exempted from it.

(f) A candidate who completes, or has completed Part A and who when taking Part B, passes in section (a) (Electrotechnology and Elementary Naval Architecture), but fails in section (b) (Engineering Knowledge and Oral), shall be given a pass in section (a) and subject to the provisions of regulation 57, may sit for re-examination in section (b).

(g) A candidate who completes, or has completed, Part A, and who when taking Part B, passes in section (b) (Engineering Knowledge and Oral) but fails in section



(Elektrotegnologie en Elementêre Skeepsboukunde) druipt, moet 'n slaagpunt vir afdeling (b) gegee word en kan behoudens die bepalings van regulasie 57 'n hereksamen in afdeling (a) aflê.

*Eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieuroffisier (Vreemde Vaart)*

53. (1) Die leerplanne vir die eksamen vir 'n sertifikaat van bekwaamheid as Hoof-ingenieuroffisier (Vreemde Vaart) word in Aanhangsel 3 uiteengesit.

(2) Die eksamen word in 2 dele verdeel, as volg:

#### Deel A

- (a) Toegepaste Meganika (1 vraestel van 3 uur).
- (b) Hitte en Hittewerktuie (1 vraestel van 3 uur).

#### Deel B

- (a) (i) Elektrotegnologie (1 vraestel van 3 uur).
- (ii) Elementêre Skeepsboukunde (1 vraestel van 3 uur).
- (b) (i) Ingenieurswese (2 vraestelle van 3 uur elk): Met dien verstande dat daar in die geval van die eksamen vir 'n gekombineerde sertifikaat (stoom en motor) 'n derde vraestel van 3 uur gestel word.

(ii) 'n Mondelinge eksamen.

(3) 'n Kandidaat kan van die hele of 'n deel van Deel A vrygestel word en kan die eksamen in afsonderlike dele aflê, as volg:

(a) 'n Kandidaat vir 'n sertifikaat van bekwaamheid as Hoofingenieuroffisier (Vreemde Vaart) kan op 'n vak-vir-vak-grondslag vrystelling van Deel A van die eksamen verleen word indien hy een of meer van die volgende kwalifikasies in Werktuigkundige, Skeeps- of Elektriese Ingenieurswese verwerf het:

- (i) Die Hoër Nasionale Tegnieëse Sertifikaat.
- (ii) Die Nasionale Tegnieëse Diploma.
- (iii) Die voltooiing deur 'n universiteitstudent van al die derdejaarskursusse van 'n Bacalaureusgraad in Werktuigkundige, Skeeps- of Elektriese Ingenieurswese.

Ondergenoemde kwalifikasies word steeds erken:

- (i) Die Nasionale Tegnieëse Sertifikaat Deel V (voorheen bekend as G.T.S. II).
- (ii) Die Nasionale Tegnieëse Diploma (voorheen bekend as die Nasionale Diploma in Ingenieurswese).
- (b) Vreemde kwalifikasies soos die "British Ordinary and Higher National Certificate", sal deur die eksaminator geëvalueer word om te bepaal of die kandidaat vir vrystelling van Deel A van een of albei die eksamens vir Tweede- en Hoof-ingenieuroffisier kwalifiseer.

(c) 'n Kandidaat kan hom te eniger tyd na slaging in die eksamen vir die sertifikaat van bekwaamheid as Tweede Ingenieuroffisier (Vreemde Vaart) of vir die hele Deel A van die eksamen of, indien kragtens paragraaf (a) gedeeltelike vrystelling aan hom verleen is, vir die oorblywende vak aanmeld.

(d) 'n Kandidaat wat nie geheel en al of gedeeltelik kragtens paragraaf (a) vrygestel is nie en wat net een vak deurkom wanneer hy Deel A van die eksamen aandurf, hoef nie weer die eksamen in daardie vak af te lê nie en kan hom behoudens die bepalings van regulasie 57 vir hereksamen in die oorblywende vak aanmeld.

(e) 'n Kandidaat kan Deel B te eniger tyd aflê mits hy die houër van 'n sertifikaat van bekwaamheid as Tweede Ingenieuroffisier (Vreemde Vaart) is en die nodige tydperk kwalifiserende seediens voltooi het en mits hy ook terselfdertyd die hele Deel A van die eksamen aflê of eksamen doen in die vak (as daar is) van daardie deel waarin hy nie reeds geslaag het of waarvan hy nie kragtens paragraaf (a) vrygestel is nie.

(a) (Electrotechnology and Elementary Naval Architecture), shall be given a pass in section (b) and, subject to the provisions of regulation 57, may sit for re-examination in section (a).

*Examination for a certificate of competency as Chief Engineer-Officer (Foreign-going)*

53. (1) The syllabuses for the examination for a certificate of competency as Chief Engineer-Officer (Foreign-going) are set out in Annex 3.

(2) The examination is divided into 2 parts, as follows:

#### Part A

- (a) Applied Mechanics (1 paper of 3 hours).
- (b) Heat and Heat Engines (1 paper of 3 hours).

#### Part B

- (a) (i) Electrotechnology (1 paper of 3 hours).
- (ii) Elementary Naval Architecture (1 paper of 3 hours).
- (b) (i) Engineering Knowledge (2 papers, each of 3 hours): Provided that in the examination for a combined certificate (steam and motor) a third paper of 3 hours is set.

(ii) Oral.

(3) A candidate may be exempted from Part A or from a part of it and may take the examination in separate parts, as follows:

(a) A candidate for a certificate of competency as Chief Engineer-Officer (Foreign-going) may be granted exemption on a subject-for-subject basis from Part A of the examination if he has obtained one or more of the following qualifications in Mechanical, Marine or Electrical Engineering:

- (i) The Higher National Certificate for Technicians.
- (ii) The National Diploma for Technicians.
- (iii) The completion by a university student of all the courses of the third year Bachelor of Science course in Mechanical, Electrical or Marine Engineering.

The under-mentioned qualifications will continue to be recognised:

- (i) The National Technical Certificate Part V (previously known as A.T.C. II).
- (ii) The National Technical Diploma (previously known as the National Engineering Diploma).

(b) Foreign qualifications such as the British Ordinary and Higher National Certificate will be evaluated by the examiner as to whether the holder is qualified for exemption from Part A of either or both the Second and Chief Engineer-Officer examinations.

(c) A candidate may present himself either for the whole of Part A of the examination, or, if he has been granted partial exemption under paragraph (a), for the remaining subject at any time after he has passed the examination for a certificate of competency as Second Engineer-Officer (Foreign-going).

(d) A candidate who has not been exempted wholly or partially under paragraph (a) and who, when attempting Part A of the examination, passes in one subject only, shall not be required to take that subject again and, subject to the provisions of regulation 57, may present himself for re-examination in the remaining subject.

(e) A candidate may take Part B at any time provided he holds a certificate of competency as Second Engineer-Officer (Foreign-going) and has completed the necessary period of qualifying sea service, and provided also that he takes at the same time either the whole of Part A of the examination or such subject, if any, in that Part in which he has not already passed or from which he has not been exempted under paragraph (a).

(f) 'n Kandidaat mag nie 'n slaagpunt in Deel B of in enige afdeling van Deel B gegee word nie tensy hy Deel A terselfdertyd as Deel B voltooi of reeds tevore voltooi het of van Deel A vrygestel is.

(g) 'n Kandidaat wat Deel A voltooi of voltooi het en wanneer hy Deel B van die eksamen aflê, in afdeling (a) (Elektrotegnologie en Elementêre Skeepsboukunde) slaag maar in afdeling (b) (Ingenieurswese en Mondeling) druip, moet 'n slaagpunt vir afdeling (a) gegee word en kan behoudens die bepalings van regulasie 57 'n hereksamen in afdeling (b) aflê.

(h) 'n Kandidaat wat Deel A voltooi of voltooi het en wanneer hy Deel B van die eksamen aflê, in afdeling (b) (Ingenieurswese en Mondeling) slaag maar in afdeling (a) (Elektrotegnologie en Elementêre Skeepsboukunde) druip, moet 'n slaagpunt vir afdeling (b) gegee word en kan behoudens die bepalings van regulasie 57 te eniger tyd 'n hereksamen in afdeling (a) aflê.

*Eksamen vir endossering van 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) of Hoof-ingenieur-offisier (Vreemde Vaart)*

54. Die eksamen vir die endossering van 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) of Hoof-ingenieur-offisier (Vreemde Vaart) moet uit die volgende bestaan:

- (a) Een skriftelike vraestel van 3 uur in Ingenieurswese,
- (b) 'n Mondelinge eksamen.

Die leerplanne vir hierdie eksamens word in Aanhangsel 3 uiteengesit.

#### *Punte vereis vir slaging*

55. (1) Ten einde in die skriftelike deel van die eksamen vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) en endossement of Hoof-ingenieur-offisier (Vreemde Vaart) en endossement te slaag, moet 'n kandidaat vir elke vak 'n minimum puntetal en ook vir al die vakke saam minstens die helfte van die totale puntetal behaal. In die mondelinge eksamen word 'n hoër standaard vereis.

(2) Die uitslag van die eksamen sal deur die eksaminator aan die kandidaat meegedeel word.

### HOOFSTUK IX

#### EKSAMENS: CERTIFIKAAT VAN BEKWAAMHEID AS HOOF-INGENIEUROFFISIER — SPESIALE GRAAD.

##### *Algemeen*

56. (1) Die eksamen vir 'n sertifikaat van bekwaamheid as Hoofingenieur-offisier—Spesiale Graad dek die leerplanne vir die eksamens vir sertifikate van bekwaamheid as Tweede Ingenieur-offisier (Vreemde Vaart) en Hoof-ingenieur-offisier (Vreemde Vaart) soos uiteengesit in Aanhangsel 3, asook die leerplan uiteengesit in Aanhangsel 4.

(2) Die eksamen word in 2 dele verdeel, as volg:

##### **Deel A**

- (a) Masjienleer (Hidromeganika) (1 vraestel van 3 uur).
- (b) Sterkteleer en eienskappe van materiale (1 vraestel van 3 uur).
- (c) Toegepaste Termodinamika (1 vraestel van 3 uur).
- (d) Skeepshittewerktuie (1 vraestel van 3 uur).

##### **Deel B**

- (a) Ingenieurswese (1 vraestel van 3 uur).
- (b) Opstel (tyd toegelaat 3 uur).
- (c) Elektrotegnologie (1 vraestel van 3 uur).
- (d) Skeepsboukunde (1 vraestel van 3 uur).
- (e) Masjienontwerp (Tekene) (tyd toegelaat 6 uur).

(f) A candidate shall not be given a pass in Part B or in either section of Part B unless he completes Part A at the same time as Part B or unless he has previously completed it, or has been exempted from it.

(g) A candidate who completes, or has completed Part A and who, when taking Part B, passes in section (a) (Electrotechnology and Elementary Naval Architecture), but fails in section (b) (Engineering Knowledge and Oral), shall be given a pass in section (a) and, subject to the provisions of regulation 57, may sit for re-examination in section (b).

(h) A candidate who completes, or has completed Part A and who, when taking Part B, passes in section (b) (Engineering Knowledge and Oral) but fails in section (a) (Electrotechnology and Elementary Naval Architecture), shall be given a pass in section (b) and, subject to the provisions of regulation 57, may sit for re-examination in section (a) at any time.

*Examination for endorsement of a certificate of competency as Second Engineer-Officer (Foreign-going) or Chief Engineer-Officer (Foreign-going)*

54. The examination for the endorsement of a certificate of competency as Second Engineer-Officer (Foreign-going) or Chief Engineer-Officer (Foreign-going) shall consist of—

- (a) one written paper of 3 hours in Engineering Knowledge;
- (b) oral.

The syllabuses for these examinations are set out in Annex 3.

#### *Marks required for pass*

55. (1) To secure a pass in the written portion of the examination for a certificate of competency as Second Engineer-Officer (Foreign-going) and endorsement or Chief Engineer-Officer (Foreign-going) and endorsement, a candidate shall be required to obtain a minimum number of marks in each subject and also to obtain not less than one half of the total number of marks for all subjects. In the oral examination a higher standard will be required.

(2) The result of the examination will be communicated to the candidate by the examiner.

### CHAPTER IX

#### EXAMINATIONS: CERTIFICATE OF COMPETENCY AS CHIEF ENGINEER-OFFICER—SPECIAL GRADE

##### *General*

56. (1) The examination for a certificate of competency as Chief Engineer-Officer—Special Grade covers the syllabuses for the examinations for certificates of competency as Second Engineer-Officer (foreign-going) and Chief Engineer-Officer (foreign-going) set out in Annex 3, as well as the syllabus set out in Annex 4.

(2) The examination is divided into 2 parts, as follows:

##### **Part A**

- (a) Theory of Machines (Mechanics of Fluids) (1 paper of 3 hours).
- (b) Strength and Properties of Materials (1 paper of 3 hours).
- (c) Applied Thermodynamics (1 paper of 3 hours).
- (d) Marine Heat Engines (1 paper of 3 hours).

##### **Part B**

- (a) Engineering Knowledge (1 paper of 3 hours).
- (b) Essay (time allowed 3 hours).
- (c) Electrotechnology (1 paper of 3 hours).
- (d) Naval Architecture (1 paper of 3 hours).
- (e) Machine Design (Drawing) (time allowed 6 hours).



(3) Vrystellingskwalifikasies wat aanvaar word vir die verlening van vrystelling van enige van die vakke gedek deur hierdie eksamen word uiteengesit in regulasie 41 (3) asook in Aanhangsel 7 van hierdie regulasies.

(4) 'n Kandidaat kan hom vir die hele eksamen op dieselfde tydstop of vir die twee dele by afsonderlike eksamens aanmeld, en in laasgenoemde geval moet die kandidaat eers Deel A deurkom ten einde vir toelating tot Deel B te kwalifiseer.

(5) Indien 'n kandidaat kies om die hele eksamen meteen af te lê en net in Deel B slaag, kan hy by 'n verdere eksamen net Deel A aflê en word by van verdere eksamen in Deel B vrygestel.

(6) 'n Kandidaat moet vir elke vraestel 'n minimum puntetal en vir al die vraestelle saam, hetsy vir die hele eksamen of vir Deel A of Deel B indien hulle afsonderlik afgelê word, minstens 60 persent van die totale punte behaal.

(7) 'n Kandidaat kan, indien hy dit verlang, versoek dat 'n slaagpunt in Deel A of Deel B op sy sertifikaat van bekwaamheid as Hoof-ingenieur-offisier van 'n stoom- of motorskip op vreemde vaart geëndosseer word. Sodanige gedeeltelike slaagpunt bly voortdurend geldig.

## HOOFTUK X

### DRUIPPING IN EKSAMEN VIR 'N ANDER SERTIFIKAAT VAN BEKWAAMHEID AS DIE AS HOOF-INGENIEUROFFISIER—SPESIALE GRAAD.

#### *Algemeen*

57. (1) As daar in 'n eksamen vir 'n sertifikaat van bekwaamheid, uitgesonderd 'n sertifikaat van bekwaamheid as Hoof-ingenieur-offisier—Spesiale Graad—gedruip word in 'n vak waarvan onkundigheid daartoe kan lei dat 'n Ingenieur-offisier in die behartiging van enige deel van 'n skip se masjinerie iets doen wat werklik onveilig is of nalaat om iets te doen wat met die oog op veiligheid noodsaaklik is (bv. druipling in vroeë oor manipulasie en die aflees van die waterpeilglas, die gevaar van brand en ontploffings in stoom- en motorskepe), word dit as druipling in praktiese kennis beskou en mag 'n kandidaat wat aldus gedruip het, hom nie vir hereksaminering aanmeld alvorens hy bewys van verdere seediens in 'n kwalifiserende hoedanigheid lewer nie.

(2) 'n Kandidaat wat weens onkunde omtrent grondbeginsels of weens algemene gebrek aan kennis in die eksamen druipt, mag hom vir 'n tydperk wat deur die eksaminator bepaal moet word maar wat nie drie maande te bowe gaan nie, nie vir hereksaminering aanmeld nie: Met dien verstande dat die Sekretaris behoudens die bepalings van subregulasie (5) na eie oordeel 'n langer tydperk as drie maande kan bepaal.

(3) 'n Kandidaat wat in 'n eksamen druipt onder ander omstandighede as wat in subregulasies (1) en (2) uiteengesit word, kan hom te eniger tyd na verstryking van een maand sedert sy jongste poging vir eksamen aanmeld, maar as hy binne 'n tydperk van drie maande drie maal in Deel A of drie maal in Deel B druipt, mag hy vir 'n tydperk wat deur die eksaminator bepaal moet word maar wat nie drie maande te bowe gaan nie, nie weer geëksamineer word nie: Met dien verstande dat die Sekretaris behoudens die bepalings van subregulasie (5) na eie oordeel 'n tydperk van langer as drie maande kan bepaal.

(4) Die tydperk verdere seediens wat by subregulasie (1) vereis word, moet deur die eksaminator bepaal word en mag nie drie maande te bowe gaan nie tensy die voorafgaande goedkeuring van die Sekretaris verkry is in 'n geval waar die eksaminator van mening is dat langer diens as drie maande geregverdig is.

(3) Exempting qualifications acceptable for the grant of exemption from any of the subjects covered by this examination are outlined in regulation 41 (3) and also in Annex 7 to these regulations.

(4) A candidate may present himself either for the whole examination at one time, or for the two parts at separate examinations, and in the latter case the candidate shall first pass in Part A to qualify for entrance to Part B.

(5) If a candidate who chooses to take the whole examination at one time passes only in Part B, he shall be eligible to sit for Part A at any further examination and shall be exempt from further examination in Part B.

(6) A candidate shall obtain a minimum number of marks in each paper, and not less than 60 per cent of the total marks throughout the examination, either for the whole examination or for Part A or Part B if taken separately.

(7) A candidate may if he so desires request that a pass in either Part A or Part B be endorsed on his certificate of competency as Chief Engineer-Officer of a foreign-going steamship or motorship. Such a partial pass shall remain valid for all time.

## CHAPTER X

### FAILURE IN EXAMINATION FOR A CERTIFICATE OF COMPETENCY OTHER THAN AS CHIEF ENGINEER-OFFICER—SPECIAL GRADE

#### *General*

57. (1) Failure in a subject in an examination for a certificate of competency other than as Chief Engineer-Officer—Special Grade, ignorance of which may lead an Engineer-Officer to do something really unsafe in the management of any part of a ship's machinery or to fail to do something essential in the interests of safety (e.g. failure in questions on manipulation and reading of the watergauge, the danger of fire and explosion in steamships and motorships), shall be regarded as failure in practical knowledge, and a candidate so failing shall not present himself for re-examination until he produces proof of further sea service in a qualifying capacity.

(2) A candidate who fails in an examination through ignorance of fundamental principles or on account of general defectiveness shall not present himself for re-examination for a period of up to three months, to be determined by the examiner: Provided that the Secretary in his discretion may, subject to the provisions of subregulation (5), fix a period in excess of three months.

(3) A candidate who fails in an examination in circumstances other than those set out in subregulations (1) and (2) may present himself for examination at any time after one month has elapsed since his previous attempt, but if he fails three times in Part A or three times in Part B within any period of three months he shall not be examined for a period of up to three months, to be determined by the examiner: Provided that the Secretary in his discretion may, subject to the provisions of subregulation (5), fix a period in excess of three months.

(4) The period of further sea service required in terms of subregulation (1) shall be determined by the examiner and shall not exceed three months, unless, in a case where the examiner is of the opinion that a period of service in excess of three months is warranted, the prior approval of the Secretary has been obtained.

(5) Die tydperk wat moet verstryk alvorens 'n kandidaat hom weer vir eksamen mag aanmeld en wat ooreenkomstig subregulasie (2) of (3) deur die Sekretaris bepaal word, of die tydperk verdere seediens wat by subregulasie (4) vereis word, mag in geen geval ses maande te bowe gaan nie.

## HOOFSTUK XI

### AFNEEM VAN EKSAMENS (ALLE KANDIDATE)

#### *Kandidate moet betyds wees*

58. 'n Kandidaat moet stip op die bepaalde tyd by die eksamenkamer wees.

#### *Vreemdelinge nie toegelaat nie*

59. Afsien van iemand wie se pligte dit van hom vereis om aanwesig te wees, word niemand gedurende die eksamen in die kamer toegelaat nie. Geen instrukteur word op die perseel toegelaat terwyl 'n eksamen aan die gang is nie.

#### *Stilte*

60. Terwyl 'n skriftelike eksamen aan die gang is, moet stilte in die eksamenkamer bewaar word.

#### *Los velle papier en boeke*

61. Voordat die eksamen begin, moet alle ander stukke papier en boeke as dié wat kragtens hierdie regulasies in die eksamenkamer toegelaat word, van die tafels of lessenaars verwyder word.

#### *Gebruik van wiskundetafels*

62. 'n Kandidaat mag nie sonder die eksaminator se voorafgaande toestemming ander wiskundetafels gebruik as dié wat deur die eksaminator verskaf is nie.

#### *Gebruik van instrumente*

63. (1) Tekenborde en tekenhake wat vir gebruik in die eksamen nodig is, sal deur die eksaminator verskaf word, maar 'n kandidaat moet self sy tekeninstrumente verskaf.

(2) 'n Kandidaat wat vir sy berekenings van rekenliniale of rekentoestelle gebruik maak, moet in ink in die eksamenskrif 'n volledige uiteensetting gee van die stappe wat nodig is om die antwoorde te verkry. As die uiteensetting nie aldus gegee word nie, word geen punte ten opsigte van die betrokke antwoorde toegeken nie.

(3) Die gebruik van rekenliniale en rekentoestelle is onderworpe aan die goedkeuring van die eksaminator wat hom daarvan moet vergewis dat inligting op rekenliniale nie oormatig is nie en dat rekentoestelle nie geprogrammeer kan word nie. Die eksaminator moet ook die gebruik van mini-rekentoestelle verbied in eksamens in suiwer en toegepaste wiskunde waar die basiese wiskundige beginsels bewys moet word.

#### *Ongeoorloofde boeke en papiere streng verbode*

64. 'n Kandidaat mag nie ander boeke, aantekeninge, memorandums of papiere by hom hê as wat vir gebruik in die eksamen verskaf is nie. Indien 'n kandidaat boeke, aantekeninge, memorandums, of papier met hom saamgebring het, moet hy hulle aan die eksaminator oorhandig voordat hy met die eksamen begin.

#### *Beskadiging van boeke, instrumente, ens.*

65. Indien 'n kandidaat 'n boek, dokument of instrument wat deur die eksaminator aan hom verskaf is, skend of andersins beskadig, moet hy die beskadigde boek, dokument of instrument vervang of anders die skade vergoed.

#### *Verlating van kamer*

66. 'n Kandidaat mag nie sy sitplek of die eksamenkamer sonder die toestemming van die eksaminator verlaat nie. Indien hy die kamer verlaat, mag hy nie sonder die toestemming van die eksaminator aangaan met 'n vraestel of probleem waarmee hy besig was nie.

(5) The period of time which must elapse before a candidate may again present himself for examination and which is fixed by the Secretary in terms of subregulation (2) or (3), or the period of further sea service required in terms of subregulation (4), shall in no case exceed six months.

## CHAPTER XI

### CONDUCT OF EXAMINATIONS (ALL CANDIDATES)

#### *Candidates to be punctual*

58. A candidate shall appear at the examination room punctually at the time appointed.

#### *No strangers admitted*

59. No person other than a person whose duties require him to be present shall be allowed in the room during examination. No instructor shall be allowed on the premises while an examination is in progress.

#### *Silence*

60. Silence shall be kept in the examination room while a written examination is in progress.

#### *Loose papers and books*

61. Before the examination begins, the tables or desks shall be cleared of all scraps of paper and books other than those permitted in the examination room in terms of these regulations.

#### *Use of mathematical tables*

62. A candidate shall not, without the examiner's prior permission, use any mathematical tables other than those provided by the examiner.

#### *Use of instruments*

63. (1) Drawing boards and T-squares necessary for use in the examination will be supplied by the examiner, but a candidate shall provide his own drawing instruments.

(2) A candidate who uses a slide rule or a calculating instrument for his calculations shall show in ink on the answer paper the full working statement necessary for arriving at the results. If the statement is not so shown, no marks shall be given in respect of the results concerned.

(3) The use of slide rules and calculating instruments is subject to the approval of the examiner who shall satisfy himself that information on slide rules is not excessive and that calculating instruments cannot be programmed. The examiner shall also prohibit the use of minicalculators in examinations on pure and applied mathematics in which basic mathematical principles have to be demonstrated.

#### *Unauthorised books and papers strictly forbidden*

64. A candidate shall not have with him any books, notes, memoranda or papers other than those supplied for use at the examination. If a candidate has brought any books, notes, memoranda or papers with him, he shall hand them to the examiner before commencing the examination.

#### *Damage to books, instruments, etc.*

65. If a candidate defaces or otherwise damages any book, document or instrument supplied to him by the examiner, he shall replace the damaged book, document or instrument, or otherwise make good the damage.

#### *Leaving room*

66. A candidate shall not, without the permission of the examiner, leave his seat or the examination room. If he leaves the room, he shall not without the consent of the examiner go on with any paper or problem on which he was engaged.



*Alle werk moet getoon word*

67. (1) 'n Kandidaat moet net op die een kant van die papier werk of skryf. Hy moet duidelik en leesbaar skryf en sy naam onderaan elke vel teken.

(2) 'n Kandidaat moet nie sy probleme op skeurpapier uitwerk en mag ook nie op die vloeiop papier skryf wat aan hom vir gebruik in die eksamen verskaf is nie.

(3) Alle werk, uitgesonderd sketse en tekeninge, moet in ink gedoen word.

(4) 'n Oortreding van die bepalings van hierdie regulasie kan die verbeuring van punte tot gevolg hê.

*Straf vir afskryf, ens.*

68. 'n Kandidaat wat gedurende die eksamen 'n ongeoorloofde boek of papier raadpleeg of van iemand anders afskryf of aan iemand anders hulp verleen of inligting verstrek of op enige wyse met iemand anders in verbinding tree, of wat enige deel van die probleme afskryf met die doel om hulle uit die eksamenkamer te neem, word geag in die eksamen te gedruip het en mag ses maande lank nie vir hereksaminering aangeneem word nie. 'n Kandidaat wat aan 'n tweede oortreding skuldig bevind word, mag nie toegelaat word om binne 12 maande na sodanige tweede oortreding eksamen te doen nie. Elke oortreding moet deur die eksaminator by die Sekretaris aangemeld word.

*Kandidate kan van eie metodes gebruik maak*

69. 'n Kandidaat kan die verskillende probleme uitwerk volgens enige metode waaraan hy gewoon is, mits die beginsel van sodanige metode reg is. Vir duidelike stellings, beredenering en berekening in die oplossing van die probleme sal gepaste erkenning verleen word.

*Straf vir oortreding van regulasies*

70. Indien 'n kandidaat 'n ander regulasie oortree as een vir die oortreding waarvan 'n ander straf by hierdie regulasies voorgeskryf word, of indien 'n kandidaat astant is teenoor 'n eksaminator of hom in of by die eksamenkamer onordelik of onbehoorlik gedra, kan die eksaminator met hom handel asof hy in die eksamen gedruip het, en indien daar aldus met hom gehandel word, mag hy drie maande lank nie as kandidaat vir hereksaminering aanvaar word nie.

## HOOFSTUK XII

## UITREIKING VAN SERTIFIKATE

*Eksamenuitslae*

71. Die uitslag van die eksamen vir 'n bekwaamheid-sertifikaat moet op die vorm wat deur die Sekretaris goedgekeur is, deur die eksaminator aan die kandidaat meegeleë word.

*Vorm van bekwaamheid-sertifikaat en dienssertifikaat*

72. Behoudens die bepalings van regulasie 74 moet elke bekwaamheid-sertifikaat in een van die toepaslike vorms wees soos in Aanhangsel 5 uiteengesit, en moet elke diens-sertifikaat in die vorm wees soos in Aanhangsel 6 uiteengesit.

*Uitreiking van 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart), Hoofingenieur-offisier (Kusvaart), Tweede Ingenieur-offisier (Vreemde Vaart) of Hoofingenieur-offisier (Vreemde Vaart)*

73. As 'n kandidaat vir 'n sertifikaat van bekwaamheid as Tweede Ingenieur-offisier (Kusvaart), Hoofingenieur-offisier (Kusvaart), Tweede Ingenieur-offisier (Vreemde Vaart) of Hoofingenieur-offisier (Vreemde Vaart) die ervaring opgedoen, die toepaslike werkwinkel- en seediens verrig en in die toepaslike eksamen voorgeskryf by hierdie regulasies geslaag het, moet die sertifikaat behoude word: Met dien verstande dat indien dit ooreenkomstig hierdie regulasies vir die kandidaat nodig is om 'n

*All work to be shown*

67. (1) A candidate shall work or write only on one side of the paper and shall write in a clear and legible hand and shall sign his name at the foot of each page.

(2) A candidate shall not work out his problems on waste paper, nor write on the blotting paper supplied for his use in the examination.

(3) All work other than sketching and drawing shall be done in ink.

(4) A contravention of the provisions of this regulation may involve loss of marks.

*Penalty for copying, etc.*

68. A candidate who refers to an unauthorised book or paper, or copies from another or affords any assistance or gives any information to another, or communicates in any way with another during the time of examination, or copies any part of the problems for the purpose of taking them out of the examination room, shall be regarded as having failed the examination, and shall not be accepted for re-examination for a period of six months. A candidate guilty of a second offence shall not be allowed to be examined until 12 months have elapsed after such second offence. Each offence shall be reported to the Secretary by the examiner.

*Candidates may use own method*

69. A candidate may work out the various problems according to any method he has been accustomed to use, provided such method is correct in principle. Suitable recognition will be given for clear statements, reasoning and calculation in solving the problems.

*Penalty for breach of regulations*

70. If a candidate contravenes any of these regulations other than a regulation for the contravention of which another penalty is by these regulations prescribed, or is insolent to an examiner, or conducts himself in a disorderly or improper manner in or about the examination room, the examiner may treat him as having failed the examination, and if he is so treated he shall not be accepted for re-examination for a period of three months.

## CHAPTER XII

## ISSUE OF CERTIFICATES

*Result of examination*

71. The result of the examination for a certificate of competency shall be conveyed by the examiner to the candidate on the form approved by the Secretary.

*Form of certificate of competency and certificate of service*

72. Subject to the provisions of regulation 74, every certificate of competency shall be in one of the appropriate forms set out in Annex 5 and every certificate of service shall be in the form set out in Annex 6.

*Issue of certificate of competency as Second Engineer-Officer (Coasting), Chief Engineer-Officer (Coasting), Second Engineer-Officer (Foreign-going) or Chief Engineer-Officer (Foreign-going)*

73. If a candidate for a certificate of competency as Second Engineer-Officer (Coasting), Chief Engineer-Officer (Coasting), Second Engineer-Officer (Foreign-going) or Chief Engineer-Officer (Foreign-going), has gained the experience and performed the appropriate workshop and sea service and has passed the appropriate examination prescribed by these regulations, the certificate shall, subject to the provisions of these regulations, be issued to him: Provided that if in terms of these regulations it is necessary for the candidate to hold any

bekwaamheidsertifikaat te hou ten einde die eksamen te kan aflê, hy laasgenoemde sertifikaat aan die eksaminator moet afgee.

#### *Endossering van 'n bekwaamheidsertifikaat*

74. (1) Indien 'n kandidaat die houer is van 'n bekwaamheidsertifikaat wat hom die reg gee om in 'n bepaalde graad of hoedanigheid op te tree op 'n skip wat met 'n sekere soort aandrywingsmasjinerie (stoom of motor) toegerus is, en indien sodanige kandidaat op grond van die verrigting van die voorgeskrewe seediens en slaging in die voorgeskrewe eksamen kwalifiseer vir 'n bekwaamheidsertifikaat wat hom die reg gee om in 'n bepaalde graad of hoedanigheid op te tree op 'n skip wat met 'n ander soort aandrywingsmasjinerie (motor of stoom) toegerus is, kan laasgenoemde sertifikaat waarvoor hy aldus gekwalifiseer het, die vorm aanneem van 'n endossement op die sertifikaat waarvan hy reeds die houer is welke endossement die graad of hoedanigheid waarin sy verdere kwalifikasie hom die reg gee om op te tree, asook die soort aandrywingsmasjinerie van die skip moet meld.

(2) Indien 'n kandidaat die houer is van 'n bekwaamheidsertifikaat (stoom of motor) wat hom die reg gee om in 'n bepaalde graad of hoedanigheid op te tree en hy kwalifiseer vir 'n bekwaamheidsertifikaat (stoom of motor) wat hom die reg gee om in 'n hoër graad of hoedanigheid op te tree, kan op laasgenoemde sertifikaat waarvoor hy aldus gekwalifiseer het, 'n verdere sertifikaat geëndosseer word waarin verklaar word dat hy geregtig is om ook op 'n skip toegerus met stoom- of motoraandryfmasjinerie, na gelang van die geval, op te tree in die graad of hoedanigheid vermeld in eersgenoemde sertifikaat.

(3) Indien 'n kandidaat die houer is van 'n bekwaamheidsertifikaat wat hom die reg gee om in 'n bepaalde graad of hoedanigheid op 'n skip op vreemde vaart op te tree en hy kwalifiseer vir 'n bekwaamheidsertifikaat wat hom die reg gee om in 'n bepaalde graad of hoedanigheid op 'n kusvaarder op te tree, kan laasgenoemde sertifikaat waarvoor hy aldus gekwalifiseer het, die vorm aanneem van 'n endossement op die sertifikaat waarvan hy reeds die houer is en sodanige endossement moet die graad of hoedanigheid op die kusvaarder meld waarin sy verdere kwalifikasie hom die reg gee om op te tree.

(4) Aan iemand wat die houer is van 'n bekwaamheidsertifikaat wat hom die reg gee om in 'n bepaalde graad of hoedanigheid op 'n skip op vreemde vaart op te tree, kan 'n ander sertifikaat uitgereik word wat hom magtig om op 'n kusvaarder op te tree in die graad of hoedanigheid waarin hy kragtens die sertifikaat waarvan hy reeds die houer is, mag optree, en sodanige latere sertifikaat kan die vorm aanneem van 'n endossement op sodanige vroeëre sertifikaat.

#### *Uitreiking van sertifikaat van bekwaamheid as Hoof-ingenieur-offisier—Spesiale Graad*

75. 'n Sertifikaat van bekwaamheid as Hoof-ingenieur-offisier—Spesiale Graad—moet uitgereik word aan 'n kandidaat wat kragtens die bepalings van die Wet daartoe geregtig is of behoudens die bepalings van hierdie regulasies in die voorgeskrewe eksamen geslaag het: Met dien verstande dat 'n kandidaat wat in die voorgeskrewe eksamen geslaag het, sy sertifikaat van bekwaamheid waarvan in regulasie 41 (1) melding gemaak word, aan die eksaminator moet afgee.

certificate of competency in order that he may be qualified to sit for the examination, he shall surrender the last-mentioned certificate to the examiner.

#### *Endorsement of a certificate of competency*

74. (1) If a candidate holds a certificate of competency which entitles him to act in a particular grade or capacity in a ship fitted with a certain kind of propelling machinery (steam or motor), and by having performed the prescribed sea service and having passed the prescribed examination, qualifies for a certificate of competency entitling him to act in a particular grade or capacity in a ship fitted with another kind of propelling machinery (motor or steam), the latter certificate for which he has so qualified may be in the form of an endorsement on the certificate which he already holds stating the grade or capacity in which his further qualification entitles him to act, as well as the kind of propelling machinery of the ship.

(2) If a candidate holds a certificate of competency (steam or motor) which entitles him to act in a particular grade or capacity, and qualifies for a certificate of competency (steam or motor) which will entitle him to act in a higher grade or capacity, the latter certificate for which he has so qualified may be endorsed with a further certificate stating that he is also entitled to act in the grade or capacity specified in the former certificate in a ship fitted with steam-driven or motor propelled machinery, as the case may be.

(3) If a candidate holds a certificate of competency which entitles him to act in a particular grade or capacity in a foreign-going ship and qualifies for a certificate of competency entitling him to act in a particular grade or capacity in a coasting ship, the latter certificate for which he has so qualified may be in the form of an endorsement on the certificate which he already holds stating the grade or capacity in the coasting ship in which his further qualification entitles him to act.

(4) A person who holds a certificate of competency which entitles him to act in a particular grade or capacity in a foreign-going ship, may be issued with another certificate authorising him to act in the grade or capacity in a coasting ship in which he, on the strength of the certificate which he already holds, is authorised to act, and such latter certificate may be in the form of an endorsement on such former certificate.

#### *Issue of certificate of competency as Chief Engineer—Officer—Special Grade*

75. A certificate of competency as Chief Engineer—Officer—Special Grade shall be issued to a candidate who is entitled thereto in accordance with the provisions of the Act, or, subject to the provisions of these regulations, who has passed the prescribed examination: Provided that a candidate who has passed the prescribed examination shall surrender his certificate of competency referred to in regulation 41 (1) to the examiner.



## HOOFSTUK XIII

## DIENSSERTIFIKATE: ALGEMEEN

*Kwalifikasies van personeel van die Suid-Afrikaanse Vloot vir dienssertifikate kragtens artikel 80 van die Wet*

76. (1) 'n Applikant vir 'n dienssertifikaat as Tweede Ingenieur-offisier (Vreemde Vaart) moet die rang van Vloot-ingenieur-offisier of Vloot Tegniese Ingenieur of Adjutant-offisier Klas I bereik het en moet minstens 21 maande as 'n Vlootwaghous-offisier met minstens nege maande op 'n stoomskip of motorskip afhangende van die soort dienssertifikaat wat vereis word diens verrig het sedert die datum waarop aan hom 'n toepaslike Vlootwaghousertifikaat toegeken is. Indien 'n gekombineerde dienssertifikaat vir stoomskepe en motorskepe vereis word, moet die applikant bewys lewer van 24 maande seediens waarvan minstens nege maande op 'n stoomskip en minstens nege maande op 'n motorskip bestee is. Die oorblywende ses maande kan op enige van dié vaartuie bestee gewees het.

(2) 'n Applikant vir 'n dienssertifikaat as Hoof-ingenieur-offisier (Vreemde Vaart) moet die rang van Vloot-ingenieur-offisier of Vloot Tegniese Ingenieur bereik het en moet minstens 21 maande as 'n Waghous-ingenieur-offisier, Senior Ingenieur-offisier of Ingenieur-offisier met minstens nege maande op 'n stoomskip of motorskip afhangende van die soort dienssertifikaat wat vereis word diens verrig het sedert die datum waarop aan hom 'n Vloot-beheersertifikaat toegeken is. Indien 'n gekombineerde dienssertifikaat vir stoomskepe en motorskepe vereis word moet die applikant bewys lewer van 24 maande seediens waarvan minstens nege maande op 'n stoomskip en minstens nege maande op 'n motorskip bestee is. Die oorblywende ses maande kan op enige van dié vaartuie bestee gewees het. Hierdie diens moet verrig gewees het terwyl hy genoemde range beklee het en tel vanaf die datum waarop aan hom 'n Vloot-beheersertifikaat toegeken is.

(3) Die houër van 'n dienssertifikaat—stoom of 'n dienssertifikaat—motor, kan toegelaat word om die eksamen af te lê vir die endossement van 'n sertifikaat soos in regulasie 33 of regulasie 37, na gelang van die geval, uiteengesit, nadat hy die betrokke gelde betaal het wat by regulasie 47 voorgeskryf is.

(4) Elke aansoek om 'n dienssertifikaat moet skriftelik deur die Hoof van die Vloot of 'n offisier aan wie hy die taak gedelegeer het, ondersteun word.

*Aansoek om 'n dienssertifikaat*

77. 'n Applikant vir 'n dienssertifikaat ooreenkomstig artikel 80 van die Wet moet aansoek doen op die vorm goedgekeur deur die Sekretaris en dit saam met die voorgeskrewe bedrag aan die bevoegde beamppte oorhandig of pos. Die bevoegde beamppte moet die aansoek aan die Sekretaris deurstuur.

## AANHANGSEL 1

## (1) VOORBEELD VAN VORM VIR GETUIGSKRIF OOR WERKWINKELDIENS

Naam en adres van ingenieurswerkwinkel.....

Ek sertifiseer dat die volgende 'n volledige en juiste opgawe is van die werkwinkeldiens wat deur ..... onder my toesig by bovermelde werkwinkel verrig is.

## CHAPTER XIII

## CERTIFICATES OF SERVICE: GENERAL

*Qualifications of South African Navy personnel for certificates of service under section 80 of the act*

76. (1) An applicant for a certificate of service as Second Engineer-Officer (Foreign-going) shall have attained the status of Naval Engineer-Officer or Naval Technical Officer or Warrant Officer Class I, and shall have performed at least 21 months sea service as a Naval Watchkeeping Officer with a minimum of nine months on a steamship or motorship, depending on the type of certificate of service required, since the date on which he was awarded an appropriate Naval Watchkeeping Certificate. If a combined certificate of service for steamships and motorships is required, the applicant shall provide evidence of 24 months' sea service, of which at least nine months shall have been performed on a steamship and at least nine months on a motorship. The balance of six months may have been served on either type of vessel.

(2) An applicant for a certificate of service as Chief Engineer-Officer (Foreign-going) shall have attained the status of Naval Engineer-Officer or Naval Technical Officer and shall have performed at least 21 months' sea service as Watchkeeping Engineer-Officer, Senior Engineer-Officer or Engineer-Officer, with a minimum of nine months on a steamship or motorship, depending upon the type of certificate of service required, since the date on which he was awarded a Naval Charge Certificate. If a combined certificate of service for steamships and motorships is required the applicant shall provide evidence of 24 months' sea service, of which at least nine months shall have been performed on a steamship and at least nine months on a motorship. The balance of six months may have been served on either type of vessel. This service shall have been performed in the ranks mentioned and shall be calculated from the date on which he was awarded a Naval Charge Certificate.

(3) The holder of a steam certificate of service or a motor certificate of service may be permitted to take the endorsement examination set forth in regulation 33 or regulation 37 as the case may be after payment of the relative fee prescribed in regulation 47.

(4) Every application for a certificate of service shall be supported in writing by the Chief of the Navy or an officer to whom he delegates the duty.

*Application for a certificate of service*

77. An applicant for a certificate of service in terms of section 80 of the Act shall apply on the form approved by the Secretary, and shall hand or post it to the proper officer together with the prescribed fee. The proper officer shall forward the application to the Secretary.

## ANNEX 1

## (1) SPECIMEN FORM OF TESTIMONIAL FOR WORKSHOP SERVICE

Name and address of engineering works.....

I certify that the following is a full and true statement of the workshop service performed by ..... under my supervision at the above works.

| Dienstydperk:<br>Datums |     | Totale<br>tydperk | Aard van<br>pligte (kyk<br>hieronder vir<br>gepaste<br>beskrywing) | Besonderhede van<br>tydperke wat<br>vakleerling week-<br>liks vrygehad het<br>om aan tegniese<br>studie te bestee |
|-------------------------|-----|-------------------|--------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Van                     | Tot |                   |                                                                    |                                                                                                                   |
|                         |     |                   |                                                                    |                                                                                                                   |
|                         |     |                   |                                                                    |                                                                                                                   |
|                         |     |                   |                                                                    |                                                                                                                   |
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|                         |     |                   |                                                                    |                                                                                                                   |
|                         |     |                   |                                                                    |                                                                                                                   |
|                         |     |                   |                                                                    |                                                                                                                   |

Verslag oor bekwaamheid.....  
 Verslag oor gedrag.....  
 Opmerkings (as daar is).....  
 Handtekening van werkgever of sy verteenwoordiger.....

### Beskrywing van pligte

I. Monteer- en/of oprigtingswerk in die vervaardiging en/of onderhoud van groot masjiene (bv. masjiene met 'n hoofas van dikker as 153 millimeter).

II. Ander monteerwerk as in verband met groot masjinerie.

III. Metaaldraaiwerk (goeie swaar werk).

IV. Masjienwerk (uitgesonderd draaibankwerk).

V. Werk in tekenkantoor as tekenaar of ingenieur.

VI. Ander werk waarvan die aard gespesifiseer moet word.

Behalwe in die geval van VI is dit voldoende om die toepaslike syfer te gebruik.

### (2) VOORBEELD VAN VORM VIR GETUIGSKRIF OOR SEEDIENS

Naam en adres van skeepseienaar of maatskappy .....

Ek sertifiseer dat die volgende 'n volledige en juiste opgawe is van die seediens wat deur mnr. .... onder my toesig verrig is aan boord van die\*.....

| Tydperk van<br>diens: Datums |     | Rang van<br>offisier en<br>werklike<br>senioriteit<br>op waghoudiens | Tipe van hoof-<br>masjiene en<br>ketels: Een of<br>twee skroewe | Aard van pligte<br>(kyk hieronder<br>vir toepaslike<br>beskrywing) |
|------------------------------|-----|----------------------------------------------------------------------|-----------------------------------------------------------------|--------------------------------------------------------------------|
| Van                          | Tot |                                                                      |                                                                 |                                                                    |
|                              |     |                                                                      |                                                                 |                                                                    |
|                              |     |                                                                      |                                                                 |                                                                    |
|                              |     |                                                                      |                                                                 |                                                                    |
|                              |     |                                                                      |                                                                 |                                                                    |
|                              |     |                                                                      |                                                                 |                                                                    |
|                              |     |                                                                      |                                                                 |                                                                    |
|                              |     |                                                                      |                                                                 |                                                                    |

Verslag oor bekwaamheid.....  
 Verslag oor gedrag.....  
 Verslag oor matigheid.....  
 Handtekening van Hoof-ingenieur.....  
 Opmerkings (as daar is).....

Handtekening van { Ingenieursuperintendent.....  
 of  
 Gesagvoerder of ander verteenwoordiger van  
 eienaar.....

\* Vermeld naam van skip, amptelike nommer en of dit 'n stoomskip of motorskip is.

### Beskrywing van pligte

I. Monteerwerk hetsy bedags of op gereelde waghoudiens:

(a) Binne hoofmasjiene- en -ketelruime.

(b) Buite hoofmasjiene- en -ketelruime.

II. (a) Koel- of ander masjiene wat nie vir die aandrywing van die vaartuig noodsaaklik is nie.

(b) Hulpmasjiene geskei van hoofaandrywingseenhede maar saam met sulke eenhede gebruik.

| Period of<br>service: Dates |    | Total<br>period | Nature of<br>duties (for<br>appropriate<br>description<br>see below) | Particulars of<br>weekly release<br>periods to permit<br>apprentice to<br>pursue technical<br>studies |
|-----------------------------|----|-----------------|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| From                        | To |                 |                                                                      |                                                                                                       |
|                             |    |                 |                                                                      |                                                                                                       |
|                             |    |                 |                                                                      |                                                                                                       |
|                             |    |                 |                                                                      |                                                                                                       |
|                             |    |                 |                                                                      |                                                                                                       |
|                             |    |                 |                                                                      |                                                                                                       |
|                             |    |                 |                                                                      |                                                                                                       |
|                             |    |                 |                                                                      |                                                                                                       |

Report as to ability.....  
 Report as to conduct.....  
 Remarks (if any).....  
 Signature of employer or his representative.....

### Description of duties

I. Fitting and/or erecting in the manufacture and/or maintenance of substantial machinery (e.g. machinery with main shaft exceeding 153 millimetres in diameter).

II. Fitting other than on substantial machinery.

III. Metal turning (good heavy work).

IV. Machine work (other than lathe).

V. Work in drawing office, as draughtsman or engineer.

VI. Other work, the nature of which should be specified.

The use of the appropriate numerals is sufficient except in the case of VI.

### (2) SPECIMEN FORM OF TESTIMONIAL FOR SEA SERVICE

Name and address of shipowner or company.....

I certify that the following is a full and true statement of the sea service performed by Mr..... under my supervision on board the\*.....

| Period of<br>service: Dates |    | Rank of<br>officer and<br>actual<br>seniority<br>on watch | Type and main<br>engines and<br>boilers: single<br>or twin-screw | Nature of duties<br>(for appropriate<br>description see<br>below) |
|-----------------------------|----|-----------------------------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------|
| From                        | To |                                                           |                                                                  |                                                                   |
|                             |    |                                                           |                                                                  |                                                                   |
|                             |    |                                                           |                                                                  |                                                                   |
|                             |    |                                                           |                                                                  |                                                                   |
|                             |    |                                                           |                                                                  |                                                                   |
|                             |    |                                                           |                                                                  |                                                                   |
|                             |    |                                                           |                                                                  |                                                                   |
|                             |    |                                                           |                                                                  |                                                                   |

Report as to ability.....  
 Report as to conduct.....  
 Report as to sobriety.....  
 Signature of Chief Engineer.....  
 Remarks (if any).....

Signature of { Engineer Superintendent.....  
 or  
 Master or other representative of owner.....

\* State name of ship, official number, and whether steam or motor ship.

### Description of duties

I. On fitters' work either by day or regular watch:

(a) Within main engine and boiler spaces.

(b) Outside main engine and boiler spaces.

II. (a) On refrigerating or other machinery not essential to the propulsion of the vessel.

(b) On auxiliary engines separated from main propulsion units but worked in conjunction therewith.



## III. Gereelde waghoudiens by die hoofmasjiene as—

- (a) Eerste Masjienuitassistent onder die senior beampte in volle beheer;
- (b) Tweede Masjienuitassistent;
- (c) Junior Masjienuitassistent.

## IV. Gereelde waghoudiens by hoofketels:

- (a) In beheer van alle stookruime.
- (b) In beheer van net 'n afdeling of van een stookruim.
- (c) As Ketelruitassistent.

## V. Gereelde waghoudiens gelyktydig by hoofmasjiene en ketels:

- (a) In volle beheer van die hele wag.
- (b) As Eerste Assistent van die senior beampte in volle beheer.
- (c) As Junior Assistent.

*N.B.*—Daar word aanbeveel dat hierdie vorm gebruik word wanneer die ingenieur oor wie verslag gedoen word, of die Hoof-ingenieur die skip verlaat.

## AANHANGSEL 2

## LEERPLANNE VIR DIE EKSAMENS VAN TWEDE INGENIEUROFFISIER (KUSVAART) EN HOOF-INGENIEUROFFISIER (KUSVAART)

*Opmerkings*

- (1) Die probleme kan kennis van die S.I.-stelsel vereis maar sal sodanig wees dat hulle met 'n kennis van elementêre algebra, meetkunde en vlakdriehoeksmeting opgelos kan word.
- (2) Kennis van die gebruik van logaritmes sal vereis word.
- (3) Waar die oplossing van 'n probleem meer gevorderde wiskunde of konstantes vereis, sal formules verstrekkend word.
- (4) Grafiese oplossings sal aanvaar word waar nie uitdruklik om die analitiese oplossing gevra word nie.
- (5) As hulle wil, kan kandidate in hul berekenings van rekenliniale gebruik maak, maar in elke geval moet 'n volledige uiteensetting gegee word van die stappe wat tot die antwoord lei.

TWEDE INGENIEUROFFISIER (KUSVAART)—  
ALGEMENE INGENIEURSWETENSKAP

(Een vraestel van 3 uur. Net 6 vrae moet beantwoord word)

*Algemeen.*—Oppervlaktes, volumes en gewigte. Soortlike gewig.

*Statika.*—Krag, kragdriehoek. Kragmoment, Kragtepare. Swaartepunte.

*Wrywing.*—Wrywingskoeffisiënt. Energie en krag wat as gevolg van wrywing in enkelvoudige laers verlore gaan.

*Kinematika.*—Lineêre en hoekbeweging. Vergelykings vir verplasing, snelheid en egalige versnelling.

*Dinamika.*—Arbeid, krag. Potensiële en kinetiese energie.

*Masjiene.*—Eenvoudige hysmasjiene. Snelheidsverhouding, meganiese voordeel en rendement van die volgende masjiene:

Skroefdomkrag, hidrouliese domkrag, toukatrolblokke en wurmgedrewe kettingkatrolle.

*Spanning en vervorming.*—Trek-, druk- en skuifspanning. Vervorming. Werkspanning en veiligheidsfaktor.

*Balke.*—Vrydraers en enkelvoudig gesteunde balke met gekonsentreerde belastinge.

*Hidrostatika.*—Soortlike gewig. Beginsel van flottasie.

*Elektrisiteit.*—Uitwerking van elektriese stroom. Eenhede: ampère, ohm en volt. Selle en batterye—onderhou en laai. Meetinstrumente.

## III. On regular watch on main engines as:

- (a) First Engine Room Assistant under the senior in full charge;
- (b) Second Engine Room Assistant;
- (c) Junior Engine Room Assistant.

## IV. On regular watch on main boilers:

- (a) In charge of all stokeholds.
- (b) In charge of a section or one stokehold only.
- (c) As Boiler Room Assistant.

## V. On regular watch on main engines and boilers simultaneously:

- (a) In full charge of the entire watch.
- (b) As First Assistant to the senior in full charge.
- (c) As Junior Assistant.

*Note.*—It is recommended that this form should be used when the Engineer reported on, or when the Chief Engineer, leaves a ship.

## ANNEX 2

## SYLLABUSES FOR THE EXAMINATIONS OF SECOND ENGINEER-OFFICER (COASTING) AND CHIEF ENGINEER-OFFICER (COASTING)

*Notes*

- (1) The problems may require a knowledge of the S.I. system, but will be such as can be solved by a knowledge of elementary algebra, geometry and plane trigonometry.
- (2) A knowledge of the use of logarithms will be required.
- (3) Formulae involving higher mathematics or constants required for the solution of any problem will be given.
- (4) Graphical solutions will be acceptable where the analytical solution is not expressly stated to be required.
- (5) Candidates may, if they wish, use slide rules for their calculations, but in each case a full statement of the steps leading to the calculations must be shown.

SECOND ENGINEER-OFFICER (COASTING)—  
GENERAL ENGINEERING SCIENCE

(One paper of 3 hours, 6 questions only to be attempted)

*General.*—Areas, volumes and mass measures. Density.

*Statics.*—Force, triangle of forces. Moment of a force.

*Couples.*—Centres of gravity.

*Friction.*—Coefficient of friction. Energy and power lost due to friction in simple bearings.

*Kinematics.*—Linear and angular motion. Equations for displacement, velocity and uniform acceleration.

*Dynamics.*—Work, power. Potential and kinetic energy.

*Machines.*—Simple lifting machines. Velocity ratio, mechanical advantage and efficiency of the following machines:

Screw jack, hydraulic jack, rope pulley blocks and worm-driven chain blocks.

*Stress and strain.*—Tensile, compressive and shear stress. Strain Working stress and factor of safety.

*Beams.*—Cantilevers and simply supported beams with concentrated loads.

*Hydrostatics.*—Density. Principle of flotation.

*Electricity.*—Effects of electrical current. Units—ampère, ohm and volt. Cells and batteries—maintenance and charging. Measuring instruments.

### HOOF-INGENIEUROFFISIER (KUSVAART)— ALGEMENE INGENIEURSWETENSKAP

(Een vraestel van 3 uur. Net 6 vrae moet beantwoord word)

*Statika.*—Swaartekragenhede. Kragtedriehoek en -veelhoek. Resultante en ekwilibrant van 'n reeks saamlopende en saamvakkige kragte. Kragmoment. Kragtepare. Hellende vlak.

*Wrywing.*—Wrywingskoeffisiënt. Arbeid verrig teen wrywing. Wrywingskoppelaars. Vrywing op hellende vlak en op drade.

*Kinematika.*—Lineêre en hoekbeweging met konstante versnelling. Betrekklike snelhede in net een vlak. Vergeelykings vir verplasing, snelheid en egalige versnelling.

*Dinamika.*—Energiebewaring. Newton se bewegingswette. Momentum. Middelpuntvliedende krag en die toepassing daarvan op onbelaste reëlaars.

*Masjiene.*—Skroef- en hidrouliese domkragte. Differentiaalrolle. Hysmasjiene. Reduksieratwerk.

*Spanning en vervorming.*—Wet van Hooke. Elastisiteitsmodulus. Trektoetse.

*Balke.*—Vrydraers en enkelvoudig gesteunde balke met gekonsentreerde of egalig verspreide belastings. Skuifkrag- en buigmomentdiagramme. Spanning as gevolg van buiging waar die fundamentele buigvergeelyking en tweede moment van die oppervlakte van die profiel verstrekkend word.

*Wringing.*—Wringmoment as gevolg van krukmeganisme van masjien. Sterkte en styfheid van soliede ronde asse waar die fundamentele wringvergeelyking en die polêre tweede moment van oppervlakte verstrekkend word. Kragooring deur asse.

*Dun huide.*—Spannings in dun silindervormige huide wat aan inwendige druk onderworpe is.

*Lasse.*—Sterkte van enkel-, dubbel- en driedubbelgeklinte oorslag- en stootlasse.

*Hidrostatika.*—Die ewewig van drywende liggame. Wisseling van vloeistofdruk na gelang van diepte. Totale krag as gevolg van vloeistofdruk op ingedompelde plat vlakke, vertikaal of horisontaal. Drukpunt op 'n reghoekige plat vlak met een rand parallel met die oppervlak van die vloeistof.

*Hidroulika.*—Volpypstroming van vloeistof deur pype onder konstante drukhoogte. Stroming deur opening. Snelheids-, krimpings- en uittatingskoeffisiënt. Verhouding tussen snelheid van vaartuig en brandstofverbruik met konstante verplasing indien die variasie tussen weerstand en snelheid verstrekkend word.

*Elektrisiteit.*—Voortbrenging van EMK deur middel van chemiese stowwe en magnete. Wet van Ohm. Serie- en parallelkring van bronne van EMK en van weerstande. Stroomverdeling van eenvoudige kringe. Geleierweerstand, uitwerking van lengte, oppervlakte, materiaal en temperatuur. Beginsels en funksie van skakelbordanwysinstrumente. Gebruik van aardlampe. Gebruik van sekering en stroombrekers.

### TWEEDE INGENIEUROFFISIER (KUSVAART)— HITTE EN HITTEWERKTUIG

(Eenvraestel van 3 uur. Net 6 vrae moet beantwoord word)

*Grondbeginsels.*—Lineêre en volumetriese uitsetting as gevolg van temperatuurverandering. Koeffisiënte en verband tussen hulle.

*Hitte en hitteoordrag.*—Hitte-eenhede. Soortlike warmte. Meganiese ekwivalent van hitte. Hitte-ekwivalent van krag. Warmte-oordrag deur geleiding, konveksie en straling.

*Mengsels.*—Hitte- en temperatuurprobleme waarby hoogstens drie stowwe betrokke is.

*Gasse.*—Wette van Boyle en Charles betreffende ideale gasse. Absolute temperatuur.

### CHIEF ENGINEER-OFFICER (COASTING)— GENERAL ENGINEERING SCIENCE

(One paper of 3 hours, 6 questions only to be attempted)

*Statics.*—Gravitational units. Triangle and polygon of forces. Resultant and equilibrant of a series of concurrent and co-planar forces. Moment of a force. Couples. Inclined plane.

*Friction.*—Coefficient of friction. Work done against friction. Friction clutches. Friction on inclined plane and on threads.

*Kinematics.*—Linear and angular motion with constant acceleration. Relative velocities in one plane only. Equations for displacement, velocity and uniform acceleration.

*Dynamics.*—Conservation of energy. Newton's laws of motion. Momentum. Centrifugal force and its application to unloaded governors.

*Machines.*—Screw and hydraulic jacks. Differential pulley blocks. Lifting machines. Reduction gearing. Stress and Strain—Hooke's Law. Modulus of elasticity. Tensile tests.

*Beams.*—Cantilevers and simply supported beams with concentrated or uniformly distributed loads. Shearing force and bending moment diagrams. Stress due to bending, given the fundamental bending equation and the polar second moment of area of the section.

*Torsion.*—Twisting moment due to engine crank mechanism. Strength and stiffness of solid circular shafts given the fundamental torsion equation and the polar second-moment of area. Power transmitted by shafts.

*Thin shells.*—Stresses in thin cylindrical shells subject to internal pressure.

*Joints.*—Strength of single, double and treble riveted lap and butt joints.

*Hydrostatics.*—Equilibrium of floating bodies. Variation of fluid pressure with depth. Total force due to liquid pressure on immersed plane surfaces, vertical or horizontal. Centre of pressure on a rectangular plane surface with one edge parallel to the surface of the liquid.

*Hydraulics.*—Full bore flow of liquid through pipes under constant head. Flow through orifice. Coefficient of velocity contraction and discharge. Relation between speed of vessel and fuel consumption with constant displacement given the variation between resistance and speed.

*Electricity.*—Production of e.m.f. by chemical and magnetic means. Ohm's law. Series and parallel circuits of sources of e.m.f. and of resistances. Current distribution of simple circuits. Conductor resistance, effect of length, area, material and temperature. Principles and function of switchboard indicating instruments. Use of earth lamps. Use of fuses and circuit breakers.

### SECOND ENGINEER-OFFICER (COASTING)— HEAT AND HEAT ENGINES

(One paper of 3 hours, 6 questions only to be attempted)

*Elements.*—Linear and volumetric expansion due to temperature changes. Coefficients and relationship between them. Temperature and its measurement.

*Heat and heat transfer.*—Heat units. Specific heat capacity. Mechanical equivalent of heat. Heat equivalent of power developed. Heat transfer by conduction, convection and radiation.

*Mixtures.*—Heat and temperature problems involving not more than three substances.

*Gases.*—Boyle's and Charles's laws for perfect gases. Absolute temperature.



*Binnebrandenjins en lugkompressors.*—Grondbeginsels en motorslag. Berekening van verrigte arbeid volgens verstrekte formules. Brandstofverbruik.

*Eienskappe van stoom.*—Toestandsverandering. Waarneembare warmte. Latente warmte. Nat, droë en oorverhitte stoom en die hoeveelhede hitte daarby betrokke. Gebruik van verkorte stoomtafels. Rendement van ketels.

*Suierstoom-masjien.*—Wysediagramme. Gemiddelde effektiewe druk en verrigte arbeid (in die veronderstelling dat  $PV=C$ ). Aangeewe en remkrag. Voordele van die aanwending van die uitsettingswerking van stoom en van hoë- en laedrukwerking. Eenvoudige skuif- en suierkleppe. Berekening van voorloophoek, lap, voorloop en poort.

*Verbranding.*—Vaste en vloeibare brandstowwe.

*Verkoeling.*—Dampverdigtingsiklus.

*Ketels en verdampstoele.*—Verandering van digtheid as gevolg van besoedelde voedingswater.

#### HOOF-INGENIEUROFFISIER (KUSVAART)— HITTE EN HITTEWERKTUIG

(Een vraestel van 3 uur. Net 6 vrae moet beantwoord word)

*Grondbeginsels.*—Formules vir werk gedoen wat met die formule  $PV^n=C$  in verband staan. Eerste wet van termodinamika.

*Eienskappe van stoom.*—Waarneembare, latente en totale warmte. Gebruik van stoomtafels. Inwendige energie.

*Mengsels.*—Hitte- en temperatuurprobleme waarby drie of meer stowwe betrokke is.

*Gasse.*—Wet van Boyle, Wet van Charles. Karakteristieke vergelyking. Verhoudings tussen P, V en T wanneer  $PV^n=C$ . Probleme met betrekking tot lugkompressors, binnebrandmasjiene, lugpompe en lugopberging.

*Uitsetting van stoom.*—Hipotetiese PV-diagramme. Arbeid verrig g.e.d., diagramfaktor, insluitende die uitwerking van vryruimte. Gemiddelde ontwerpdruk.

*Stoomsiklus.*—Uitwerking van modifikasies soos oorverhitting, uitlaatturbine en ontwikkelingsstoeververhitting op termiese rendement. Ekwivalente verdamping. Rendemente.

*Digtheid en ketelsteen.*—Basiese berekenings oor die uitwerking van lekkasie in die kondensator en onsuivere voedingswater op die digtheid en ketelsteen in ketels.

*Stoomturbine.*—Grondbeginsels en berekenings.

*Verbranding.*—Berekening van lug teoreties vereis.

*Verkoeling.*—Werkverrigtingskoëffisiënt. Die gebruik van tafels van eienskappe van verkoelers.

#### TWEEDE INGENIEUROFFISIER (KUSVAART) EN HOOF-INGENIEUROFFISIER (KUSVAART)— INGENIEURSWESE

Kandidate vir 'n gekombineerde stoom- en motorsertifikaat moet bereid wees om in al die items (a) tot (w) geëksamineer te word, maar kandidate sal vir 'n stoomsertifikaat of die stoomendossement op 'n motorsertifikaat nie in items (q) tot (w) en vir 'n motorsertifikaat of die motorendossement op 'n stoomsertifikaat nie in items (j) tot (p) geëksamineer word nie. Kandidate vir die sertifikaat van Hoof-ingenieur-offisier (Kusvaart) of 'n endossement op die sertifikaat van Hoof-ingenieur-offisier (Kusvaart), van wie verwag word om 'n ruimer kennis van die verskillende items in die leerplan aan die dag te lê as kandidate vir die Sertifikaat van Tweede Ingenieur-offisier (Kusvaart) of 'n endossement op 'n Sertifikaat van Tweede Ingenieur-offisier (Kusvaart), moet bereid wees om in items (x) tot (y) geëksamineer te word.

#### Opmerkings

1. Die kennis van Ingenieurswese wat deur kandidate aan die dag gelê moet word, is dié wat vereis word vir die

*I.C. engines and air compressors.*—Elementary principles and cycles of operation. Calculation of work done from given formulae. Fuel consumption.

*Properties of steam.*—Change of state. Sensible heat. Latent heat. Wet, dry and superheated steam and the quantities of heat involved. Use of abridged steam tables. Boiler efficiency.

*Reciprocating steam engine.*—Indicator diagrams. Mean effective pressure and work done (assuming  $PV=C$ ). Indicated and brake power. Advantages of using steam expansively and of compounding. Simple slide and piston valves. Calculation of angle of advance lap, lead and port opening.

*Combustion.*—Solid and liquid fuels.

*Refrigeration.*—Vapour-compression cycle.

*Boilers and evaporators.*—Change of density due to contaminated feed water.

#### CHIEF ENGINEER-OFFICER (COASTING)—HEAT AND HEAT-ENGINES

(One paper of 3 hours, 6 questions only to be attempted)

*Elements.*—Formulae for work done associated with the formulae  $PV^n=C$ . First law of thermodynamics.

*Properties of steam.*—Sensible, latent and total heat. Use of steam tables. Internal energy.

*Mixtures.*—Heat and temperature problems involving three or more substances.

*Gases.*—Boyle's law. Charles's law. Characteristics equation. Relations between P, V and T when  $PV^n=C$ . Problems involving air compressors, internal combustion engines, air pumps and air storage.

*Expansion of steam.*—Hypothetical PV diagrams. Work done, m.e.p., diagram factor, including effect of clearance. Mean referred pressure.

*Steam cycle.*—Effect on thermal efficiency of such modifications as superheating, exhaust turbine and generative feed heating. Equivalent evaporation. Efficiencies.

*Density and scale.*—Basic calculations on the effect of condenser leakage and impure feed water on the density and scale in boilers.

*Steam turbine.*—Elementary principles and calculations.

*Combustion.*—Calculation of theoretical air required.

*Refrigeration.*—Coefficient of performance. The use of tables of properties of refrigerants.

#### SECOND ENGINEER-OFFICER (COASTING) AND CHIEF ENGINEER-OFFICER (COASTING)—ENGI- NEERING KNOWLEDGE

Candidates for a combined Steam and Motor Certificate must be prepared to be examined in all the items (a) to (w), but those for a Steam Certificate or the Steam endorsement of a Motor Certificate will not be examined in items (q) to (w) and those for a Motor Certificate or the Motor Endorsement of a Steam Certificate will not be examined in items (j) to (p).

In addition, candidates for a certificate of Chief Engineer-Officer (Coasting) or an endorsement of a certificate of Chief Engineer-Officer (Coasting), who will be expected to display a fuller knowledge of the different items in the syllabus than candidates for a certificate of Second Engineer-Officer (Coasting) or an endorsement of a certificate of Second Engineer-Officer (Coasting), must be prepared to be examined in items (x) to (y).

#### Notes

1. The engineering knowledge to be shown by candidates is that which is required for the use, operation and

gebruik, bediening en onderhoud van die masjinerie, toerusting en skeepsdele waarvoor die Ingenieur-offisier gewoonlik verantwoordelik is. Ook word kennis vereis van die metodes om die verskillende onderdele te vervaardig.

2. Kandidate vir sertifikate en endossemente moet 'n skriftelike en daarna 'n mondelinge eksamen aflê.

3. Die skriftelike eksamen vir 'n stoom- of motorsertifikaat bestaan uit 2 vraestelle van 3 uur elk. In elke vraestel moet net 6 uit die 9 vrae beantwoord word.

4. Die skriftelike eksamen vir 'n gekombineerde stoom- en motorsertifikaat bestaan uit 3 vraestelle van 3 uur elk. In elke vraestel moet net 6 uit die 9 vrae beantwoord word.

5. Die skriftelike eksamen vir 'n stoom- of motor-endossement bestaan uit 1 vraestel van 3 uur en hierin moet net 6 uit die 9 vrae beantwoord word.

6. Waar daar in die eksamen vir 'n sertifikaat van Hoof-ingenieur-offisier (Kusvaart) of 'n endossement op 'n sertifikaat van Hoof-ingenieur-offisier (Kusvaart) vrae oor Hoof- elektriese aandryfmasjinerie gevra word, word die 9 vrae vermeerder met die getal vrae oor hoof- elektriese aandryfmasjinerie.

7. Kandidate kan versoek word om hul antwoorde met sketse toe te lig:

(a) Die verskillende behandelings se algemene uitwerking op die fisiese eienskappe van materiale wat algemeen by die bou van skeepsmasjiene en -ketels gebruik word, en die meganiese toetse waaraan hierdie materiale gewoonlik onderwerp word.

(b) Warmte en verbranding. Die eienskappe van stoom, brandstof, smeermiddels en ander vloeistowwe, gasse en dampe wat in masjinerie op 'n skip gebruik word.

(c) Die gebruik, konstruksiebesonderhede en beginsels betrokke by die werking van die drukmeter, voltmeter, ammeter, termometer, pirometer, barometer, salinometer, hidrometer en ander meters wat algemeen deur ingenieurs op 'n skip gebruik word.

(d) Die oorsake, uitwerking en gewone middels teen ketelsteenvorming en korrosie. Voedingswater en blaasdigthede en ketelsteenvorming.

(e) (1) Konstruksiebesonderhede en werkbeginsels van skeepsmasjiene; metodes om hul krag te bepaal. Die beginsels waarvolgens dinamometers en wringingsmeters werk en metodes vir hul yking.

(2) Die metodes om met slytasie in masjinerie en ketels te handel. Die rig van masjiendele. Die verhelping van defekte as gevolg van gebreke in die materiaal of 'n ongeluk. Tydelike of permanente herstelwerk in die geval van ontwinging of algehele onklarheid.

(f) Konstruksiebesonderhede en werkingsbeginsels van sentrifugale-, klepsuier- en perspompe. Die algemene vereistes met betrekking tot toevoer-, brandstof-, lens- en ballaspompstelsels.

(g) Die konstruksie inrigting, besonderhede en werking van stuurmasjiene en stuurgerei, koelmasjiene, hidrouliese masjiene en sodanige stoom- en binnebrandmasjiene as wat as nood- en hulpmasjiene aan boord gebruik word.

(h) Aanwending van die indikateur. Berekening van gemiddelde druk en krag. Wisseling van druk in silinder soos deur indikateurdiagramme getoon.

(i) (1) Voorsorgsmaatreëls teen brand of ontploffings as gevolg van olie of gas. Flitspunt. Ontploffbaarheid van gas of damp afgegee deur brandstof of smeerolies wanneer dit met 'n hoeveelheid lug gemeng is. Die gevaar van lekkasie uit olie tenks, pype, gasontwikkelaars en verdampers, vernameklik in kimme en ander ongeventileerde ruimtes. Die werking van draadgaasdiaphragmas en die plekke waar sulke inrigtings aangebring behoort te word.

(2) Selfontbranding van steenkool. Ontploffbaarheid van gas afgegee deur steenkool. Ventilasië en stuwings van steenkool.

maintenance of the machinery, equipment and ship structure usually in the charge of the Engineer-Officer. A knowledge of the methods of manufacture of the various components is also required.

2. Candidates for certificates and endorsements are required to take a written examination followed by an oral examination.

3. The written examination for a Steam or Motor Certificate consists of 2 papers of 3 hours each—6 questions only to be attempted out of 9 in each paper.

4. The written examination for a combined Steam and Motor Certificate consists of 3 papers of 3 hours each—6 questions only to be attempted out of 9 in each paper.

5. The written examination for a Steam or Motor Endorsement consists of 1 paper of 3 hours—6 questions only to be attempted out of 9 in the paper.

6. Where questions relating to main electric propelling plant are asked in the examination for a certificate of Chief Engineer-Officer (Coasting) or an endorsement of a certificate of Chief Engineer-Officer (Coasting), the 9 questions set will be increased by the number of questions set on main electric propelling plant.

7. Candidates may be required to illustrate their answers by means of sketches:

(a) The general effects of the various treatments on the physical properties of materials commonly used in the construction of marine engines and boilers, and the mechanical tests to which these materials are normally subjected.

(b) Heat and combustion. The properties of steam, fuel, lubricants and other liquids, gases and vapours used in machinery on board ship.

(c) The use, constructional details and principles involved in the action of the pressure gauge, voltmeter, ammeter, thermometer, pyrometer, barometer, salinometer, hydrometer and other meters commonly used by engineers on board ship.

(d) The causes, effects and usual remedies for incrustation and corrosion. Feed water and blow densities, and scale formation.

(e) (1) Constructional details and working principles of marine engines; methods of determining their power. The principle of working and methods of calibration of dynamometers and torsion meters.

(2) The methods of dealing with wear and tear of machinery and boilers. The alignment of machinery parts. The correction of defects due to faults in material or accident. Temporary or permanent repairs in the event of derangement or total breakdown.

(f) Constructional details and principles of action of centrifugal, bucket and force pumps. The general requirements concerning feed, fuel, bilge and ballast pumping systems.

(g) The constructional arrangement, details and working of steering-engines and gears, refrigerating machinery, hydraulic machinery, and such steam and internal combustion engines as are used for emergency and auxiliary machinery on board ship.

(h) Application of the indicator. Calculation of mean pressure and power. Fluctuation of pressure in cylinder as shown by indicator diagrams.

(i) (1) Precautions against fire or explosions due to oil or gas. Flash point. Explosive properties of gas or vapour given off by fuel or lubricating oils when mixed with a quantity of air. The danger of leakage from oil tanks, pipes, gas producers and vaporisers, particularly in bilges and other unventilated spaces. The action of wire gauze diaphragms and the places in which such devices should be fitted.

(2) Spontaneous combustion of coal. Explosive properties of gas given off by coal. Ventilation and storage of coal.



(3) Brandopsporing. Metodes van brandbestryding. Werking en onderhoud van meganiese en chemiese brandblussers en ander brandbestrydingstoestelle, gasmaskers en veiligheidslampe.

(j) Die metodes om skeepstoommasjiene en stoomketels te bou, die prosesse waaraan die verskillende dele onderwerp word of wat met hul vervaardiging gepaard gaan, en die metodes wat by die montering van die masjinerie op 'n skip aangewend word.

(k) Die verskillende tipes aandryf- en hulpstoommasjiene tans in gebruik, die funksies van elke belangrike deel en die aandag wat deur die verskillende dele van die masjinerie op 'n skip vereis word.

(l) Die metodes om stoominlaat- en -uitlaatkleppe te toets en te verstel en die wyse waarop die werking van die masjien deur besliste verstelling van die kleppe beïnvloed word.

(m) Die konstruksiebesonderhede en werking van verdampers, voedingswaterverwarmers en voedingswaterfilters.

(n) Skeepsketels van verskillende moderne ontwerpe; die manier om hulle te stut, asook die voorkoming van verskuiwing van ketels wanneer vaartuie hei of rol. Bepaling, deur berekening van geskikte werkdrukke vir ketels met verstrekte afmetings.

(o) Die gebruik en hantering van keteltoebehore en -monterings, veral watermeters en veiligheidskleppe. Nodige voorsorgmaatreëls wanneer stoom opgewek en met afsluitkleppe gewerk word, veral met betrekking tot die gevaar wat deur waterslag veroorsaak word.

(p) Konstruksiebesonderhede, werking en onderhoud van installasies wat algemeen gebruik word om lugtrek, oorverhitting van stoom en die verbranding van steenkool of oliebrandstof aan te help.

(q) Die beginsels ten grondslag van binnebrandmasjiene. Die verskil tussen verskillende tipes masjiene. Konstruksiebesonderhede van binnebrandmasjiene wat algemeen in gebruik is.

(r) Die aard en eienskappe van die brand- en smeerolies wat gewoonlik in binnebrandmasjiene gebruik word. Die toevoer van lug en brandstof na silinders van masjiene van verskillende tipes. Die konstruksiebesonderhede van apparaat vir die vergassing of verstuiwing van brandstof. Die metodes om silinders en suiers te verkoel. Konstruksiebesonderhede en werking van lugkompressors.

(s) Die metodes vir die bou van skeepsbinnebrandmasjiene. Die prosesse waaraan die verskillende dele onderwerp word of wat met hul vervaardiging gepaard gaan, en die metodes wat by die montering van die masjinerie op 'n skip aangewend word.

(t) Aansit- en omstelinrigtings en die verskillende handelinge wat daarmee in verband staan.

(u) Die aandag wat vir die werking en onderhoud van die verskillende dele van masjinerie nodig is. Die gebruik en hantering van kleppe, pype, verbindings en veiligheidstoestelle wat gebruik word.

(v) Opnoeming en beskrywing van defekte wat uit werking van masjinerie ontstaan. Die herstel van sulke defekte.

(w) Konstruksiebesonderhede en hantering van hulpstoomketels, hul toebehore en monterings, veral waterpeilglase en veiligheidskleppe. Konstruksiebesonderhede en hantering van hulpmasjinerie.

#### KANDIDAAT VIR SERTIFIKAAT VAN HOOF-INGENIEUROFFISIER (KUSVAART) EN ENDOSSEMENT OP SODANIGE SERTIFIKAAT

(x) Die administratiewe pligte van 'n Hoof-ingenieur-offisier (Kusvaart): Organiserings van sy personeel vir noodpligte en gebruik van veiligheidsuitrusting; organiserings van herstelwerk en ondersoeke. Verslae aan eienaars. Die onderhoud en werkende toestand van masjinerie en toestelle wat onder die sorg van 'n Senior Ingenieur-offisier geplaas word. Die nodige aandag om onklarheid en

(3) Fire detection. Methods of dealing with fire. Action and maintenance of mechanical and chemical fire extinguishers and other fire-fighting appliances, respirators and safety lamps.

(j) The methods of constructing marine steam engines and boilers, the processes to which the several parts are submitted, or which are incidental to their manufacture, and the methods employed in fitting the machinery on board ship.

(k) The various types of propelling and auxiliary steam engines now in use, the functions of each important part and the attention required by the different parts of the machinery on board ship.

(l) The methods of testing and altering the setting of the steam admission and exhaust valves, and the effect produced in the working of the engine by definite alterations in the settings of the valves.

(m) The constructional details and working of evaporators, feed water heaters and feed water filters.

(n) Marine boilers of various modern designs; the manner of staying them and also the prevention of movement of boilers when vessels are pitching or rolling. The determination by calculation of suitable working pressures for boilers of given dimensions.

(o) The use and management of boiler fittings and mountings, with special reference to water gauges and safety valves. Precautions necessary when raising steam and operating stop valves, with particular reference to the danger arising from water hammer action.

(p) Constructional details, operation and maintenance of installations generally employed for assisting draught, superheating steam and burning coal or oil fuel.

(q) The principles underlying the working of internal combustion engines. The difference between various types of engines. Constructional details of internal combustion engines in general use.

(r) The nature and properties of the fuel and lubricating oils generally used in internal combustion engines. The supply of air and fuels to cylinders of engines of different types. The constructional details of apparatus for carburetting or atomising the fuel. The means of cooling the cylinders and pistons. Constructional details and working of air compressors.

(s) The methods of constructing marine internal combustion engines. The processes to which the several parts are submitted or which are incidental to their manufacture, and the methods employed in fitting the machinery on board ship.

(t) Starting and reversing arrangements and the various operations connected therewith.

(u) The attention required for the operation and maintenance of the various parts of machinery. The use and management of valves, pipes, connections and safety devices employed.

(v) Enumeration and description of defects arising from working of machinery. The rectification for such defects.

(w) Constructional details and management of auxiliary steam boilers, their fittings and mountings, with special reference to water-gauges and safety valves. Constructional details and management of auxiliary machinery.

#### CANDIDATE FOR A CERTIFICATE OF CHIEF ENGINEER-OFFICER (COASTING) AND ENDORSEMENT OF SUCH CERTIFICATE

(x) The administrative duties of a Chief Engineer-Officer (Coasting): Organisation of his staff for emergency duties and the use of safety equipment; organisation of repairs and surveys. Reports to owners. The maintenance and working condition of machinery and appliances placed in the charge of a Senior Engineer-Officer. The attention required to prevent breakdowns and defects.

defekte te voorkom. Die gewone herstelwerk en vernuwings wat nodig is; toesig oor inspeksie van masjinerie en ketels op 'n skip. Gereedmaking van ketels en masjinerie vir ondersoek.

(y) Die bespeuring van onreëlmatighede in die loop van masjiene aan die hand van indikateurdiagramme. Die verhelping van hierdie onreëlmatighede. Toeligting, deur middel van sketse van die verandering in die diagram as gevolg van verstelling of 'n verandering in die werking van die kleppe of ander faktore.

### *Mondelinge eksamen*

Die mondelinge eksamen sal grotendeels op die Praktiese Kennisvakke van die eksamen gebaseer word en sal vroeë insluit oor die hantering van masjiene en ketels ter see, die pligte van 'n toesighoudende ingenieur, die werk wat in 'n hawe aan masjiene, ketels en hulpmasjiene gedoen moet word, en die periodieke ondersoek van die werkende dele.

Kandidate moet ook goed vertrou wees met foute wat ter see in masjiene en ketels kan voorkom, en moet in staat wees om te verduidelik hoe sulke foute voorkom en herstel kan word.

### AANHANGSEL 3

#### LEERPLANNE VIR DIE EKSAMENS VAN TWEDE INGENIEUROFFISIER (VREEMDE VAART) EN HOOF-INGENIEUROFFISIER (VREEMDE VAART)

#### *Opmerkings*

(1) Die probleme kan kennis van die S.I.-stelsel vereis maar sal sodanig wees dat hulle met 'n kennis van elementêre algebra, meetkunde en vlakdriehoeksmeting opgelos kan word.

(2) Kennis van die gebruik van logaritmes sal vereis word.

(3) Waar die oplossing van 'n probleem meer gevorderde wiskunde of konstantes vereis, sal formules verstrekkend word.

(4) Grafiese oplossings sal aanvaar word waar nie uitdruklik om die analitiese oplossing gevra word nie.

(5) As hulle wil, kan kandidate in hul berekenings van rekenliniale gebruik maak, maar in elke geval moet 'n volledige uiteensetting gegee word van die stappe wat tot die antwoord lei.

#### TWEDE INGENIEUROFFISIER (VREEMDE VAART)—WISKUNDE

(Een vraestel van 3 uur. Net 6 uit 9 vrae moet beantwoord word)

*Rekenkunde.*—Herleiding van fisiese hoeveelhede waarby lengte, oppervlakte, volume of krag betrokke is, van een eenheidstelsel tot 'n ander. Verhouding en eweredigheid. Persentasies.

*Algebra.*—Eksponente, met inbegrip van gebroke en negatiewe tipes. Gebruik van gewone logaritmes vir vermenigvuldiging, deling, magte en wortels. Gebruik van Neperse logaritmes. Vereenvoudiging van algebraïese uitdrukkings. Optel, aftrek, vermenigvuldiging en deling van algebraïese funksies. Herrangskikking van formules. Ontbinding in faktore. Algebraïese breuke. Kwadrate en derde-magte van veelterme soos  $(a \pm b)^2$  en  $(a \pm b)^3$ . Eenvoudige vergelykings. Kwadratiese vergelykings en oplossing deur ontbinding in faktore of deur voltooiing van die kwadraat. Bewys van algemene formule vir oplossing. Gelyktydige vergelykings, hetsy 2 lineêre vergelykings of 1 lineêre en 1 kwadratiese vergelyking. Variasie, direk en omgekeerd.

*Grafiekwerk.*—Eenvoudige grafieke van statistieke. Die grafiek  $y = ax + b$  aan die hand van of berekende waardes of eksperimentele resultate. Berekening van konstantes

The usual repairs and renewals required; supervision and inspection of machinery and boilers on board ship. Preparation of boilers and machinery for survey.

(y) The detection of irregularities in the running of engines from indicator diagrams. The rectification of these irregularities. Illustration by means of sketches of the change produced in the diagram due to an alteration in the setting or working of the valves or any other factors.

### *Oral examination*

The oral examination will be based largely upon the Practical Knowledge subjects of the examination and will include questions on the management of engines and boilers at sea, the duties of a supervising engineer, the work to be done to engines, boilers and auxiliary machinery in port and the periodical examination of the working parts.

Candidates should also be well acquainted with machinery and boiler casualties which may occur at sea and should be able to state how these may be prevented and remedied.

### ANNEX 3

#### SYLLABUSES FOR THE EXAMINATIONS OF SECOND ENGINEER-OFFICER (FOREIGN-GOING) AND CHIEF ENGINEER-OFFICER (FOREIGN-GOING)

#### *Notes*

(1) The problems may require a knowledge of the S.I. system, but will be such as can be solved by a knowledge of elementary algebra, geometry and plane trigonometry.

(2) A knowledge of the use of logarithms will be required.

(3) Formulae involving higher mathematics or constants required for the solution of any problem will be given.

(4) Graphical solutions will be acceptable where the analytical solution is not expressly stated to be required.

(5) Candidates may, if they wish, use slide rules for their calculations, but in each case a full statement of the steps leading to the calculations must be shown.

#### SECOND ENGINEER-OFFICER (FOREIGN-GOING) —MATHEMATICS

(One paper of 3 hours—6 questions only out of 9 to be attempted)

*Arithmetic.*—Conversion of physical quantities involving length, area, volume or force from one system of units to another. Ratio and proportion. Percentages.

*Algebra.*—Indices, including fractional and negative types. Use of common logarithms for multiplication, division, powers and roots. Use of Napierian logarithms. Simplification of algebraic expressions. Addition, subtraction, multiplication and division of algebraic functions. Re-arrangement of formulae. Factorisation. Algebraic fractions. Squares and cubes of polynomials such as  $(a \pm b)^2$  and  $(a \pm b)^3$ . Simple equations. Quadratic equations and solution by factorisation or by completing the square. Proof of general formula for solution. Simultaneous equations, either 2 linear equations or 1 linear and 1 quadratic. Variation, direct and inverse.

*Graphical work.*—Simple graphs of statistics. The graphs  $y = ax + b$  either from calculated values or from experimental results. Calculation of constants from graph.



volgens grafiek. Grafiese oplossing van eenvoudige gelyktydige vergelykings waarby 2 onbekendes betrokke is. Grafiek van  $y = ax^2 + bx + c$  en grafiese oplossing van vergelyking  $ax^2 + bx + c = 0$ .

**Driehoeksmeting.**—Graad- en radiaalmaat van hoeke. Komplementêre en supplementêre hoeke. Sinus, kosinus en tangens van hoeke tot 360 grade. Oplossing van reghoekige driehoeke. Bewys van die sinus- en kosinusreëls. Oplossing van driehoeke met behulp van hierdie reëls. Oplossing van eenvoudige trigonometrie vergelykings. Ontwikkeling van  $\sin(A \pm B)$  en  $\cos(A \pm B)$ .

**Meetkunde.**—Eienskappe van driehoeke. Som van die hoeke. Verhouding tussen buite- en binnehoeke. Gelykenisse en gelyktydige driehoeke. Gelykvormige en kongruente driehoeke. Die sirkel. Eienskappe van koorde en raaklyne. Hoeke in dieselfde segment. Middelpunthoeke en omtrekhoeke.

**Oppervlakte- en volumeberekening.**—Oppervlaktes van driehoek, veelhoek, parallelogram, trapesium, sirkel, sektor en segment van 'n sirkel en ellips. Oppervlaktes van skewe deursnee van reëlmatige liggame met gelykmatige dwarsdeursnee. Oppervlakte en gemiddelde hoogte volgens middelordinaatreël en volgens die eerste reël van Simpson. Oppervlakteverhouding van gelykvormige figure. Volumes en oppervlaktes van prisma's, piramides, afgeknote keëls, bolle, silinders en keëls. Volumeverhouding van gelykvormige liggame. Omwentelingsliggame.

## T W E E D E INGENIEUROFFISIER (VREEMDE VAART)—TOEGEPASTE MEGANIEKA

(Een vraestel van 3 uur. Net 6 uit die 9 vrae moet beantwoord word)

**Algemeen.**—Toepassings van oppervlaktes en volumes op probleme soos die gewig van masjienonderdele. Soortlike gewig. Eerste reël van Simpson soos toegepas op oppervlaktes en volumes.

**Statika.**—Krag. Swaartekrageenhede. Krag as 'n vektor. Kragdriehoek en koppelveelhoek. Resulterende en ewewigskrag van 'n stelsel van saamlopende saamvakkige kragte. Ewewig van 3 saamvakkige kragte. Moment van 'n krag. Kragtepare. Momente van oppervlaktes en volumes. Sentroïede en swaartepunte (beperk tot meetkundige vorms). Ewewigstoestande van vaste liggame. Hellende vlak. Nodige krag wat parallel met die vlak toegepas word om 'n liggaam teen die vlak op of af te trek of stasionêr te hou (insluitende die uitwerking van wrywing). Arbeid verrig met egalige snelheid met die vlak op.

**Wrywing.**—Wrywingswette vir droë oppervlaktes. Wrywingskoëffisiënt. Wrywingshoek. Energie en krag wat verlore gaan as gevolg van wrywing en enkelvoudige laers.

**Kinematika.**—Lineêre beweging. Grafieke en vergelykings vir verplasingspoed, snelheid en gelykmatige versnelling. Eenvoudige gevalle van vektorsnelheidsverandering en die versnelling opgelewer. Betrekklike snelhede in net een vlak. Hoëkbeweging. Vergelykings vir verplasing, snelheid en egalige versnelling.

**Dinamika.**—Arbeid en krag. Probleme met konstante krag of krag met lineêre variasie. Energie. Energiebewaring. Potensiaalenergie. Kinetiese verplasingenergie. Newton se wette van beweging. Momentum en tempo van momentum verandering. Sentrifugale krag en sy toepassing op koniese pendule, onbelaste reëlaar, gekromde bane en masjienonderdele. Spanning in dun velling as gevolg van sentrifugale werking.

**Masjiene.**—Eenvoudige hysmasjiene. Grafieke van hyskrag en hysrendement. Lineêre wet. Snelheidsverhouding, hefvoordeel en rendement van die volgende masjiene. Wiel en as, differensiaalrat en -as, toukatrolblokke, differensiaalkatrolle, skroefdomkrag. Warwick-skroef, hidrouliese domkrag, wurmgedrewe kettingkatrolle en enkel- en dubbeltakelwindasse. Reduksieratwerk.

Graphical solution of simple simultaneous equations involving 2 unknowns. Graph of  $y = ax^2 + bx + c$  and graphical solution of equation  $ax^2 + bx + c = 0$ .

**Trigonometry.**—Measurement of angles in degrees and radians. Complementary and supplementary angles. Sine, cosine and tangent of angles up to 360°. Solution of right-angled triangles. Proof of sine and cosine rules. Solution of triangles by these rules. Solution of simple trigonometric equations. Expansion of  $\sin(A \pm B)$  and  $\cos(A \pm B)$ .

**Geometry.**—Properties of triangles. Sum of the angles. Relation between exterior and interior angles. Isosceles and equilateral triangles. Similar and congruent triangles. The circle. Properties of chords and tangents. Angles in the same segment. Angles at centre and circumference.

**Mensuration.**—Areas of triangle, polygon, parallelogram, trapezium, circle, sector and segment of a circle and ellipse. Areas of oblique sections of regular solids of uniform cross-section. Area and mean height by mid-ordinate rule and by Simpson's first rule. Ratio of areas of similar figures. Volumes and surface areas of prisms, pyramids, frustums, spheres, cylinders and cones. Ratio of volumes of similar solids. Solids of revolution.

## SECOND ENGINEER-OFFICER (FOREIGN-GOING) —APPLIED MECHANICS

(One paper of 3 hours—6 questions only out of 9 to be attempted)

**General.**—Applications of areas and volumes to problems such as the mass of engine components. Density. Simpson's first rule as applied to areas and volumes.

**Statics.**—Force. Gravitational units. Force as a vector. Triangle and polygon of forces. Resultant and equilibrant of a system of concurrent co-planer forces. Equilibrium of 3 co-planer forces. Moment of a force. Couples. Moments of areas and volumes. Centroids and centres of gravity (limited to geometrical shapes). Conditions of equilibrium of solids. Inclined plane. Necessary force applied parallel to the plane to pull body up or down the plane or to hold it stationary (including effect of friction). Work done at uniform speed up the plane.

**Friction.**—Laws of friction for dry surfaces. Coefficient of friction. Friction angle. Energy and power lost due to friction in simple bearings.

**Kinematics.**—Linear motion. Graphs and equations for displacement, speed, velocity and uniform acceleration. Simple cases of vector change of velocity and the acceleration produced. Relative velocities in one plane only. Angular motion. Equations for displacement, velocity and uniform acceleration.

**Dynamics.**—Work and power. Problems with constant force or force with linear variation. Energy. Conservation of energy. Potential energy. Kinetic energy of translation. Newton's laws of motion. Momentum and rate of change of momentum. Centrifugal force and its application to conical pendulum, unloaded governor, curved tracks and machine parts. Stress in thin rim due to centrifugal action.

**Machines.**—Simple lifting machine. Graphs of load-effort and load-efficiency. Linear law. Velocity ratio, mechanical advantage and efficiency of the following machines: Wheel and axle, differential wheel and axle, rope pulley blocks, differential pulley blocks, screw jack. Warwick screw, hydraulic jack, worm-driven chain blocks and single and double purchase crab winches. Reduction gearing.

*Spanning en vervorming.*—Direkte spanning en vervorming. Skuifspanning. Wet van Hooke. Elastisiteitsmodulus. Breektreksterkte. Vloeiëspanning. Verhoudingsgrens. Persentasie verlenging en vermindering van oppervlakte. Werkspanning. Veiligheidsfaktor. Spanning as gevolg van beperkte uitsetting of sametrekking van enkelvoudige onderdele.

*Balke.*—Vrydraers en enkelvoudig gesteunde balke met gekonsentreerde of gelykmatig verspreide laste. Skuifkrag- en buigmomentdiagramme. Spanning as gevolg van buiging waar die fundamentele buigingsvergelyking en die tweede moment van oppervlakte van die deursnee verstrekk word.

*Wringing.*—Wringmoment as gevolg van krukmeganisme van masjien. Sterkte en styfheid van soliede of hol dryfasse met ronde deursnee waar die fundamentele wringvergelyking en die polêre tweede moment van oppervlakte verstrekk word. Krag oorgebring deur dryfasse. Koppelboute.

*Dun huide.*—Omtrek- en langspanning in dun silindere en bolvormige huide wat aan inwendige druk onderworpe is.

*Lasse.*—Sterkte van die volgende lasse: Enkel-, dubbel- en driedubbelgeklante lap- en stuitlasse en gesweiste stootlasse.

*Hidrostatika.*—Die beginsel van Archimedes. Ewewig van drywende voorwerpe. Soortlike gewig. Gelykgewighidrometer. Wisseling van vloeistofdruk volgens diepte. Totale krag as gevolg van vloeistofdruk op ingedompelde plat vlakke, hetsy horisontaal of vertikaal. Drukpunt op reghoekige vertikale plat vlak of driehoekige plat vlak albei met een rand parallel met die oppervlakte van die vloeistof.

*Hidroulika.*—Volpypstroming van vloeistof deur pype onder konstante drukhoogte. Stroming deur opening. Snelheidsvernouings- en uitlaatkoeffisient.

#### HOOFFINGENIEUROFFISIER (VREEMDE VAART)—TOEGEPASTE MEGANIKA

(Een vraestel van 3 uur. Net 6 uit die 9 vrae moet beantwoord word)

*Statika.*—Ewewigswette. Momente en kragtepare. Kragteveelhoek. Rapson-skuif.

*Wrywing.*—Wet van droë wrywing. Wrywingshoek. Wrywingskoppelaars. Wrywing op hellende vlak. Wrywing op drade. Arbeid verrig teen wrywing.

*Kinematika.*—Lineêre en hoekbeweging met gelykmatige versnelling. Swaartekragversnelling. Snelheid-tydgrafieke.

*Betreklike snelheid en versnelling.*—Uitwerking van 'n stroming op die snelheid en koers van 'n skip. Betreklike snelheid van voorwerpe wat in verskillende vlakke beweeg.

*Dinamika.*—Newton se wet van beweging. Die kragvergelyking. Die Atwood-masjien. Versnelling van verbinde liggame. Uitwerking van eenvoudige lugweerstand op beweging onder die invloed van swaartekrag. Die draaimomentvergelyking. Behoud van momentum. Kinetiese verplasings- en rotasie-energie. Vliegwiele. Potensiaalenergie. Behoud van energie. Impulsiewe kragte. Middelpuntvliedende krag. Porter-reëlaar met huls wrywing. Eenvoudige harmoniese beweging. Eenvoudige slinger. Eenvoudige trillings. Dinamiese balansering van massas wat in een vlak draai. Basiese dinamika van die masjienmeganisme. Gebruik van suiersnelheid- en -versnellingsformules. Afleiding van suiververplasingsformule.

*Masjiene.*—Snelheidsverhouding. Hefvoordeel. Rendement.

*Stress and strain.*—Direct stress and strain. Shear stress. Hooke's law. Modulus of elasticity. Ultimate tensile stress. Yield Stress. Limit of proportionality. Percentage elongation and reduction of area. Working stress. Factor of safety. Stress due to restricted expansion or contraction of single members.

*Beams.*—Cantilevers and simply supported beams with concentrated or uniformly distributed loads. Shearing force and bending moment diagrams. Stress due to bending, given the fundamental bending equation and the second moment of area of the section.

*Torsion.*—Twisting moment due to engine crank mechanism. Strength and stiffness of solid or hollow shafts of circular cross-section given the fundamental torsion equation and the polar second moment of area. Power transmitted by shafts. Coupling bolts.

*Thin shells.*—Circumferential and longitudinal stress in thin cylindrical and spherical shells subject to internal pressure.

*Joints.*—Strength of the following joints: Single, double and treble riveted lap and butt joints and butt welded joints.

*Hydrostatics.*—Archimedes' principle. Equilibrium of floating bodies. Density. Constant mass hydrometer. Variation of fluid pressure with depth. Total force due to liquid pressure on immersed plane surfaces, horizontal or vertical. Centre of pressure on rectangular vertical plane surface or triangular plane surface, both with one edge parallel to the surface of the liquid.

*Hydraulics.*—Full bore flow of liquid through pipes under constant head. Flow through orifice. Coefficients of velocity contraction of area and discharge.

#### CHIEF ENGINEER-OFFICER (FOREIGN-GOING) —APPLIED MECHANICS

(One paper of 3 hours, 6 questions only out of 9 to be attempted)

*Statics.*—Laws of equilibrium. Moments and couples. Polygon of forces. Rapson's slide.

*Friction.*—Law of dry friction. Friction angle. Friction clutches. Friction on inclined plane. Friction on threads. Work done against friction.

*Kinematics.*—Linear and angular motion with constant acceleration. Gravitational acceleration. Velocity-time graphs.

*Relative velocity and acceleration.*—Effect of a current on the velocity and course of a ship. Relative velocity between bodies moving in different planes.

*Dynamics.*—Newton's law of motion. The force equation. Atwood machine. Acceleration of connected bodies. Effect of simple air resistance on motion under the effect of gravity. The torque equation. Conservation of momentum. Kinetic energy of translation and of rotation. Flywheels. Potential energy. Conservation of energy. Impulsive forces. Centrifugal force. Porter governor with sleeve friction. Simple harmonic motion. Simple pendulum. Simple vibrations. Dynamic balancing of masses rotating in one plane. Basic dynamics of the engine mechanism. Use of piston velocity and acceleration formulae. Derivation of piston displacement formulae.

*Machines.*—Velocity ratio. Mechanical advantage. Efficiency.



*Spanning en vervorming.*—Regstreekse spanning en vervorming en elastisiteitsmodulus. Skuifspanning en -vervorming en skuifmodulus. Spannings op skuins vlakke. Sterkte van enkelvoudige verbindings soos spy- of skroefverbindings. Veerkragtigheid as gevolg van regstreekse spanning. Skielike belasting.

*Saamgestelde stawe.*—Uitwerking van regstreekse belasting en van temperatuurveranderinge.

*Balke.*—SK- en BM-diagramme vir vrydraers en enkelvoudige gesteunde balke. Spannings in balke met enkelvoudige deursnee. Gebruik van eenvoudige defleksieformules.

*Wringing.*—Wringvergelykings vir soliede en hol ronde dryfasse. Wringing van dryfas toegerus met voering. Krag oorgebring. Diggewikkelde spiraalveer.

*Stutte.*—Eksentriese belasting van kort kolomme. Gebruik van stutformules.

*Dun huide.*—Spannings in dun huide. Ontwerp van klinknate. Gebruik van formules vir ketelrompontwerp.

*Hidrostatika.*—Drywing in twee vloeistowwe met verskillende soortlike gewigte. Totale krag en drukpunt op ingedompelde vlakke soos tenks en skotte.

*Hidroulika.*—Bernouilli se vergelyking toegepas op eenvoudige stromingsprobleme. Die Venturimeter. Vloei deur openinge onder gelykmatige druk. Krag deur 'n straal uitgeoefen op 'n plat vlak haaks op die straal. Plathoekdiagramme vir 'n sentrifugale pomp.

## TWEDE INGENIEUROFFISIER (VREEMDE VAART)—HITTE EN HITTEWERKTUIG

(Een vraestel van 3 uur. Net 6 uit die 9 vrae moet beantwoord word)

*Grondbeginsels.*—Temperatuur en termometriese skale. Lineêre en volumetriese uitsetting as gevolg van temperatuurverandering. Koëffisiënte en die verband tussen hulle. Temperatuur en die meet daarvan.

*Hitte en hitte-oordrag.*—Soortlike warmte. Meganiese warmte-ekwivalent. Hitte-oordrag deur geleiding, konveksie en straling. Wette van geleiding en straling en eenvoudige toepassing met verstreke formules.

*Mengsels.*—Hitte- en temperatuurprobleme waarby hoogstens drie stowwe betrokke is. Waterekwivalent.

*Gasse.*—Wette van Boyle en Charles betreffende ideale gasse. Absolute temperatuur. Karakteristieke vergelyking. Konstante R en die gebruik daarvan in eenvoudige probleme. Isotermiese en adiabatiese uitsetting en kompressie. Verband tussen P, V en T wanneer  $PV^n = \text{konstante}$ . Soortlike warmtes  $C_p$  en  $C_v$  en hul verband met mekaar.

*Binnebrandmasjiene en lugkompressors.*—Grondbeginsels en motorslag. Berekening van verrigte arbeid volgens verstreke formules. Nokdiagramme vir binnebrandmasjiene, hoeke van nokspitsmiddelyle in verhouding tot kruk.

*Eienskappe van stoom.*—Verandering van entalpie met en sonder toestandsverandering. Nat, droog versadigde en oorverhitte stoom en die hoeveelheid hitte daarby betrokke. Gebruik van verkorte stoomtafels. Soortlike volume van stoom onder verskillende toestande. Smoring. Skei- en smoorkalorimeters. Rendement van ketels. Ekwivalente verdamping. Gebruik van stoomtafels in eenvoudige probleme met betrekking tot kondensators. Uitwerking van luglekasie. Suierstoomhulpmasjinerie — Diagramfaktor. Gemiddelde effektiwiteit druk en verrigte arbeid (as veronderstel word dat  $PV = C$ ). Aangegewe- en remkrag. Voordele van die aanwending van die uitsettingswerking van stoom en van hoë- en laedrukwerking. Gemiddelde ontwerpdruk. Stoomverbruik per uur en per kraguur. Termiese, meganiese en totale rendement van enkelvoudige en saamgestelde masjiene. Warmtebalans vir masjiene en keteltoetse. Eenvoudige skuif- en suierkleppe met buite- of binnetoelating van stoom. Gebruik van klepdiagramme ten einde voorloophoek, lap, voorloop en poortopening vir 'n verstrekte klepslag te bepaal.

*Stress and strain.*—Direct stress and strain and modulus of elasticity. Shear stress and strain and modulus of rigidity. Stresses on oblique planes. Strength of simple connections such as cotttered or screwed joints. Resilience due to direct stress. Suddenly applied loads.

*Compound bars.*—Effects of direct loading and of temperature changes.

*Beams.*—SF and BM diagrams for cantilevers and simply supported beams. Stresses in beams of simple section. Use of simple deflection formulae.

*Torsion.*—Torsion equations for solid and hollow round shafts. Torsion of shaft fitted with liner. Power transmitted. Close coiled helical spring.

*Struts.*—Eccentric loading of short columns. Use of strut formulae.

*Thin shells.*—Stresses in thin shells. Design of riveted joints. Use of boiler shell design formulae.

*Hydrostatics.*—Flotation in two liquids of different specific gravities. Total force and centre of pressure on immersed surfaces such as tanks and bulkheads.

*Hydraulics.*—Bernouilli's equation applied to simple flow problems. Venturi meter. Flow through orifices under constant head. Force exerted by a jet on flat surface perpendicular to the jet. Blade angle diagrams for a centrifugal pump.

## SECOND ENGINEER-OFFICER (FOREIGN-GOING)—HEAT AND HEAT ENGINES

(One paper of 3 hours, 6 questions only out of 9 to be attempted)

*Elements.*—Temperature and thermometric scales. Linear and volumetric expansion due to temperature changes. Coefficients and the relationship between them. Temperature and its measurement.

*Heat and heat transfer.*—Specific heat capacity: Mechanical equivalent of heat. Heat transfer by conduction, convection and radiation. Laws of conduction and radiation and simple applications with given formulae.

*Mixtures.*—Heat and temperature problems involving not more than three substances. Water equivalent.

*Gases.*—Boyle's and Charles's laws for perfect gases. Absolute temperature. Characteristic equation. Constant R and its use in simple problems. Isothermal and adiabatic expansion and compression. Relation between P, V and T when  $PV^n = \text{constant}$ . Specific heat  $C_p$  and  $C_v$  and the relationship between them.

*I.C. engines and air compressors.*—Elementary principles and cycles of operation. Calculation of work done from given formulae. Cam diagrams for I.C. engines, angles of cam peak centre lines relative to crank.

*Properties of steam.*—Change of enthalpy with and without change of phase. Wet, dry-saturated and superheated steam and the quantities of heat involved. Use of abridged steam tables. Specific volume of steam under various conditions. Throttling. Separating and throttling calorimeters. Boiler efficiency. Equivalent evaporation. Use of steam tables in simple problems, referring to condensers. Effect of air leakage.

*Reciprocating steam auxiliary machinery.*—Diagram factor. Mean effective pressure and work done (assuming  $PV = C$ ). Indicated and brake power. Advantages of using steam expansively and of compounding. Mean referred pressure. Steam consumption per hour and per power-hour. Thermal, mechanical and overall efficiencies of simple and compounded engines. Heat balance for engine and boiler trials.

Simple slide and piston valves with outside or inside steam admission. Use of valve diagrams to determine angle of advance, lap, lead and port opening for a given valve travel.

*Stoomturbine.*—Grondbeginsels. Eenvoudige snelheidsdiagramme. Termiese, meganiese en totale rendement.

*Verbrandings.*—Vaste en vloeibare brandstof. Hoër en laer hittewaardes. Chemiese vergelykings vir volledige verbranding. Minimum lug teoreties vereis. Oormaat lug.

*Verkoeling.*—Dampverdichtingsiklus. Verkoelende uitwerking. Verkoelende gewig. Gebruik van tafels van eienskappe van verkoelers.

*Ketels en verdampers.*—Verandering van digtheid as gevolg van besoedelde toevoer.

#### HOOFINGENIEUROFFISIER (VREEMDE VAART)— HITTE EN HITTEWERKTUIG

(Een vraestel van 3 uur. Net 6 van die 9 vrae moet beantwoord word)

*Grondbeginsels.*—Uitsetting van vaste liggame en vloeistowwe, met inbegrip van koëffisiënt van skynbare kubieke uitsetting. Eerste wet van termodinamika en sy toepassing op toestande van gelykmatige stroming. Formules vir verregte werk wat verband het met die formule  $PV^n=C$ .

*Hitte-oordrag.*—Geleiding (uitgesonderd gemiddelde temperatuurverskil van log). Straling.

*Eienskappe van stoom.*—Berekening van verandering van entalpie, inwendige energie en entropie met en sonder toestandsverandering. Gebruik van stoomtafels en entropie. Smoor- en skeikalometer.

*Mengsels.*—Toepassing van Dalton se Wet van parsiele druk.

*Gasse.*—Wet van Boyle. Wet van Charles. Karakteristieke vergelykings. Verband tussen P, V, en T wanneer  $PV^n=C$ . Bepaling van n aan die hand van grafiek van P en V verbind.

Bewys van die formule  $C_p - C_v = \frac{R}{J}$

Berekenings vir uitsettings en kompressies met lugkompressors, binnebrandmasjiene, lugpompe en lugbewaring.

*Gassiklusse.*—Gebruik van entropiekaarte. Konstante volume-siklus. Dieselsiklus. Ope en geslote siklusse vir gasturbines. Aangeduide en remwarmterendemente. Meganiese rendement. Morse-toets.

*Uitsetting van stoom.*—Smoring, uitsetting, arbeid verrig en oordrag.

*Stoomsiklus.*—Gebruik van entropiekaarte. Basiese Rankinesiklus. Hitteverlies in suiermasjiene en in turbines. Uitwerking van modifikasies soos oorverhitting, herverhitting en regeneratorvoedingsverhitting op warmerendement. Ekwivalente verdamping. Rendemente.

*Digtheid en ketelsteen.*—Basiese berekenings oor die uitwerking van lekkasie in die kondensator en onsuivere toevoer op die digtheid en ketelsteen in ketels. Basiese berekenings oor prestasie van verdampstoestel.

*Turbine.*—Basiese siklus en sy modifikasies. Vloeiing deur spuitstukke (uitgesonderd bewys van kritieke drukverhouding). Blad-diagramme vir impuls- en reaksieturbines. Krag op blaasie. Arbeid verrig op blaasie. Gebruik van entalpie-entropie-kaarte om die stoomtoestand in verskillende stadiums te bepaal.

*Verbranding.*—Verbrandingsvergelykings. Berekening van lug teoreties vereis. Bepaling van hittewaarde. Stelling van Avogadro. Basiese ontleding van uitlaatgasse. Verhouding tussen volumetriese en gravimetrisiese analise van 'n gasmengsel. Kooldioksiedgehalte van uitlaatgasse.

*Verkoeling.*—Omgekeerde Carnot-kringloop. Dampverdichtingsiklus. Gebruik van damptafels. Werkverrigtingskoëffisiënt.

*Steam turbine.*—Elementary principles. Simple velocity diagrams. Thermal, mechanical and overall efficiency.

*Combustion.*—Solid and liquid fuels. Higher and lower calorific values. Chemical equations for complete combustion. Theoretical minimum air required. Excess air.

*Refrigeration.*—Vapour-compression cycle. Refrigerating effect. Cooling load. Use of tables of properties of refrigerants.

*Boilers and evaporators.*—Change of density due to contaminated feed.

#### CHIEF ENGINEER-OFFICER (FOREIGN-GOING)— HEAT AND HEAT ENGINES

(One paper of 3 hours, 6 questions only out of 9 to be attempted)

*Elements.*—Expansion of solids and liquids including coefficient of apparent cubical expansion. First law of thermodynamics and its application to steady flow conditions. Formulae for work done associated with the formula  $PV^n=C$ .

*Heat transfer.*—Conduction (excluding log mean temperature difference). Radiation.

*Properties of steam.*—Calculation of change of enthalpy, internal energy and entropy with and without change of phase. Use of steam tables and entropy. Throttling and separating calorimeter.

*Mixtures.*—Application of Dalton's law of partial pressures.

*Gases.*—Boyle's law. Charles's law. Characteristic equation. Relations between P, V and T when  $PV^n=C$ . Determination of n from graph connecting P and V.

Proof of the formula  $C_p - C_v = \frac{R}{J}$

Calculations for expansions and compressions on air compressors, internal combustion engines, air pumps and air storage.

*Gas cycles.*—Use of entropy charts. Constant volume cycle. Diesel cycle. Open and closed cycles for gas turbines. Indicated and brake thermal efficiencies. Mechanical efficiency. Morse test.

*Expansion of steam.*—Throttling, expansion, work done and transfer.

*Steam cycle.*—Use of entropy charts. Basic Rankine cycle. Heat drop in reciprocating engines and in turbines. Effect on thermal efficiency of such modifications as superheating, reheating and regenerative feed heating. Equivalent evaporation efficiencies.

*Density and scale.*—Basic calculations on the effect of condenser leakage and impure feed on the density and scale in boilers. Basic calculations on evaporator performance.

*Turbine.*—Basic cycle and its modifications. Flow through nozzles (excluding proof of critical pressure ratio). Blade diagrams for impulse and reaction turbines. Force on blades. Work done on blades. Use of enthalpy-entropy charts to determine steam conditions at various stages.

*Combustion.*—Combustion equations. Calculation of theoretical air required. Determination of calorific value. Avogadro's hypothesis. Basic analysis of exhaust gases. Relation between volumetric and mass analysis of a gas mixture.  $CO_2$  content of exhaust gases.

*Refrigeration.*—Reversed Carnot cycle. Vapour compression cycle. Use of vapour tables. Coefficient of performance.



## TWEEDE INGENIEUROFFISIER (VREEMDE VAART)—TEKENE

(Een vraestel van 6 uur. Daar kan uit 2 tekeninge gekies word)

Die vraestel in Tekene sal bestaan uit 'n toets van die kandidaat se vermoë om die beginsels van projeksie toe te pas, en kandidate sal versoek word om 'n plan, vertikale projeksie of deursnee of 'n kombinasie van hierdie aansigte van 'n stuk skeepsmasjinerie aan die hand van verstrekte inligting te teken. Al die nodige inligting vir die voltooiing van die tekening sal in die vraestel verstrekk word.

## TWEEDE INGENIEUROFFISIER (VREEMDE VAART)—ELEKTROTEKNOLOGIE

(Een vraestel van 3 uur. Net 6 uit die 9 vrae moet beantwoord word)

*Algemeen.*—Uitwerking van elektriese stroom: Chemiese, magnetiese en termiese uitwerking en verskaffing van lig. Opwekking van EMK deur middel van chemikalieë, magnete, warmte en lig.

*Die elektriese kring.*—Eenhede, ampère, ohm en volt. Ohm se wet. Serie- en parallelkringe van bronne van EMK en van weerstande. Stroomverdeling in eenvoudige kringe. Verskil tussen EMK en pv. Krag en energie. Verband tussen verwarmings-, meganiese en elektriese eenhede. Joule se ekwivalent. Geleierweerstand, uitwerking van lengte, oppervlakte, materiaal en temperatuur. Soortlike weerstand. Temperatuurkoeffisiënt van weerstand. Tipiese isolering. Wheatstonebrug, sleepdraadbrug. Toepassings op stuurinrigtings, weerstandspirometers, vervormingsmeters, ens.

*Elektrolitiese werking.*—Teorie van elektrolitiese dissosiasie toegepas op gewone oplossings, ens., aangesuurde water, kopersulfaat en soutwater. Gebruike van elektroliese. Wette van Faraday. Elektrochemiese ekwivalent.

*Selle.*—Primêre (nat of droë Leclanché-selle) en sekondêre (suur- of alkaliese) tipes. Konstruksie en beginsels. Onderhoud, laai. Watt-uur en ampère-uurrendemente.

*Magnetisme en elektromagnetisme.*—Eenvoudige teorie van magnetisme. Magnetiese veld. Kraglyne. Veldsterkte. Veldintensiteit. Magnetiese velde as gevolg van stroom in reguit geleiers, lusgeleidings, spoel en solenoïede. Betrekklike rigtings van stroom en veld. Uitwerking op yster. Vloeidigheid. Totale vloed. Permeabiliteit. Tipiese B/H- en u/B krommes.

*Elektromagnetiese induksie.*—Wette van Faraday en Lenz. Omvang en rigting van geïndusseerde EMK. Krag voortgebring op 'n stroomdraende geleier.

*Wisselstroomteorie.*—Die sinusgolf, frekwensie, maksimum, w.g.k.- en gemiddelde waardes. Vektorvoorstelling van wisselstroomhoeveelhede. Faseverskil. Die wisselstroomkring. Die induktor. Induktansie en die uitwerking daarvan op die kring. Die verband tussen weerstand, reaktansie en impedansie. Eenvoudige behandeling van die kragfaktor.

*Instrumente.*—Beginsels en funksie van skakelbordaanswysingsinstrumente. Draaispoel-, draaiyster- en dinamometertipes. Gebruik van sjunts en serieweerstande ten einde die bestek te vergroot. Die stroomtransformator en spanningstransformator vir instrumentwerk (beskrywing en eenvoudige verduideliking).

*Toetsmetodes en metings.*—Weerstand gemeet met ammeter-voltmeter, met brug en met instrument. Eenvoudige toetsing van ohm-meter en isolering. Algemene toetsing van isolering, kontinuïteit en millivolt-daling. Opsporing van foute. Temperatuurmeting met weerstand.

*Stroomkringe.*—Eendraad-, tweedraad-, driedraad- en ringhoofleidingsnette vir gelykstroom. Gebruik van sekerings- en stroombrekers. Gebruik van aardlamp. Eenvoudige verwysing na die balanseerder. Eenvoudige verduideliking van die alternator as 'n opwekkingseenheid. Parallelwerking en sinchroniseringsprosedure.

## SECOND ENGINEER-OFFICER (FOREIGN-GOING)—DRAWING

(One paper of 6 hours. A choice of two drawings will be given)

The Drawing Paper will consist of a test of the ability to apply the principles of projection, and candidates will be asked to draw a plan, elevation or section or a combination of these views of a piece of marine machinery from information supplied. All the required information for the completion of the drawing will be given in the question paper.

## SECOND ENGINEER-OFFICER (FOREIGN-GOING)—ELECTROTECHNOLOGY

(One paper of 3 hours, 6 questions only out of 9 to be attempted)

*General.*—Effects of electric current-chemical, magnetic, thermal and production of light. Production of e.m.f. by chemical, magnetic, thermal and light means.

*The Electric Circuit.*—Units, ampere, ohm and volt. Ohm's law. Series and parallel circuits of sources of e.m.f. and of resistances. Current distribution in simple circuits. Difference between e.m.f. and pd. Power and energy. Relationships between heating, mechanical and electrical units. Joule's equivalent. Conductor resistance, effect of length, area, material and temperature. Specific resistance. Temperature coefficient of resistance. Types of insulation. Wheatstone network bridge, slide wire bridge. Applications to steering gears, resistance pyrometers, strain gauges, etc.

*Electrolytic action.*—Theory of electrolytic dissociation applied to common solutions, etc., acidulated water, copper sulphate and salt water. Uses of electrolysis. Faraday's laws. Electro-chemical equivalent.

*Cells.*—Primary (wet or dry Leclanché) and secondary (acid or alkaline) types. Construction and principles. Maintenance charging Watt-hour and ampere-hour efficiencies.

*Magnetism and electromagnetism.*—Simple magnetic theory. Magnetic field. Lines of force. Field strength. Field intensity. Magnetic fields due to current in straight conductors, loops, coils and solenoids. Relative directions of current and field. Effect of iron. Flux density. Total flux. Permeability. Typical B/H and u/B curves.

*Electro-magnetic induction.*—Faraday's and Lenz's laws. Magnitude and direction of induced e.m.f. Force produced on a current-carrying conductor.

*Alternating current theory.*—The sinusoidal wave, frequency, maximum, r.m.s. and average values. Vector representation of A.C. quantities. Phase difference. The A.C. circuit. The inductor. Inductance and its effect on the circuit. Relationship between resistance, reactance and impedance. Simple treatment of power factor.

*Instruments.*—Principles and function of switchboard indicating instruments. Moving-coil, moving-iron and dynamometer types. Uses of shunts and series resistances to increase the range. The current transformer and potential transformer for instrument work (description and simple explanation).

*Testing methods and measurements.*—Resistance measured by ammeter-voltmeter, by bridge and by instrument. Simple ohmmeter and insulation testing. General insulation, continuity and millivolt-drop testing. Fault tracing. Temperature measurement by resistance.

*Circuits.*—Single-wire, 2-wire, 3-wire and ring main systems for D.C. Use of fuses and circuit-breakers. Use of earth lamps. Simple reference to the balancer. Simple explanation of the alternator as a generating unit. Parallel running and synchronising procedure.

*Elektriese masjiene.*—Konstruksiebesonderhede van die gelykstroombenerator en -motor. Werking van kommutator. Eenvoudige benadering van lus- en golfwikkelings. Metodes om die veld van krag te voorsien—afsonderlike opwekking, sjunt, serie- en serieparallelwikkelings.

*Gelykstroombengenerators.* — Konstruksiebesonderhede. Beskerming, EMK en lasspanningsvergelykings. Kort behandeling van teorie van selfopwekking. Laskenmerke. Metodes om spanning te beheer. Parallelwerkingsprosedure.

*Gelykstroombmotore.*—Konstruksiebesonderhede. Noodsaaklikheid van aansitters. Tipes aansitters. Snelheids- en draaimomentvergelykings. Laskenmerke. Snelheidsbeheer.

*Elektriese ontsteking vir binnebrandmasjiene.*—Spoel- en magnetostelsels. Aansitnrigtings. Onderhoudsvereistes.

*Elektronika.*—Kennis van terme wat in elektriese stroom-kring gebruik word. Termioniese emissie, geleiding in vakuum, fase, isolators, semi-geleiers en geleiers, ratifikasie.

#### HOOF-INGENIEUROFFISIER (VREEMDE VAART)—ELEKTROTEGNOLOGIE

(Een vraestel van 3 uur. Net 6 uit die 9 vrae moet beantwoord word)

*Eenhede.*—S.I. Stelsel.

*Die magnetiese kring.*—B-H- en B-AT/cm-krommes. Hul uitwerking op die ontwerp van eenvoudige magnetiese kringe waarby 'n lugspleet betrokke is. Histerese. Elektromagnetisme. Wedersyde induksie.

*Die elektriese kring.*—Wette van Kirchoff. Parallelwerking van batterye met ongelyke EMK en verskillende inwendige weerstande. Verdelpingsprobleme. Spanningsval. Verdelpers met enkele en dubbele toevoer. Ringhoofleidings. Verspreidingsstelsels. Gelykstroomb: 2 draad en 3 draad. Wisselstroomb: eenfasig en driefasig, 3 draad en 4 draad. Vergelyking van koper wat vereis word. Balanseerder in gelykstroombstelsel met 3 draad.

*Motoraansitters.*—Outomatiese tipes—verwysing na tyd en stroombeheer. Die dromreëlaar vir seriemotors.

*Aanwendings, ens.*—Parallelwerking van sjunt- en serieparallel generators. Vereffeningstaaf. Lasverdeling kwalitatief behandel. Toepassings op Ward Leonardstelsel. Stuurinrigtings. Geskiktheid van gelykstroombmotore vir die verskillende soorte werk. Defekte en onderhoud van masjiene. Oorverhitting as gevolg van meganiese en elektriese defekte. Vonke by borsels. Verlies van oorblywende magnetisme, ens. Toets van masjiene—gebruik van die megger. Eenvoudige berekenings in verband met aansitters.

*Algemeen.*—Opwekking van 'n wisselspanningsgolvorm. Die sinuswet. Frekwensie; siklus amplitude, oomblik- en maksimum waardes. Verband tussen frekwensie, getal pole en snelheid van 'n masjien. W.G.K.- en gemiddelde waardes. Vormfaktor. Voorstelling van 'n wisselgrootheid deur middel van vektors ten einde oomblik- en W.G.K.-waardes te verskaf.

*Die seriekring.*—Weerstand, induktansie en impedansie. Stroom- en stroomspanningsverhoudings. Gebruik van vektors. Vermoë, skynvermoë (VA), reaktiewe volt-ampere en kragfaktor. Die impedansiedriehoek. Reaktiewe en aktiewe komponente van 'n stroom.

*Die parallelkring.*—Behandeling van taamlik eenvoudige kringe net met vektors. Kapasitansie en die aanwending van kapasitors vir kragfaktorverbetering. Die wenslikheid van hoë kragfaktore.

*Driefasestelsels.*—Ster- en delta- (veelhoek-) verbindings vir kragbronne en belastings. Fase- en lynverhoudings. Krag. Driefasige vierdraadverdelers. Aanwending by draaiende magnetiese veld.

*Alternators.*—Konstruksie. EMK-vergelyking. Sinchronisering en verwysing na lasverdeling.

*Electrical machines.*—Constructional details of the D.C. generator and motor. Action of commutator. Simple approach to lap and wave windings. Methods of supplying the field—separate excitation, shunt, series and compound windings.

*D.C. generators.*—Constructional details. Protection. E.m.f. and load voltage equation. Brief treatment of theory of self-excitation. Load characteristics. Methods of voltage control. Parallel operation procedure.

*D.C. Motors.*—Constructional details. Need for starters. Types of starter. Speed and torque equations. Load characteristics. Speed control.

*Electric ignition for I.C. engines.*—Coil and magneto systems. Starting arrangements. Maintenance requirements.

*Electronics.*—Knowledge of terms used in electronic circuits. Thermionic emission, conduction in vacuum, gases, insulators, semi-conductors and conductors, rectification.

#### CHIEF ENGINEER-OFFICER (FOREIGN-GOING)— ELECTROTECHNOLOGY

(One paper of 3 hours, 6 questions only out of 9 to be attempted)

*Units.*—S.I. system

*The magnetic circuit.*—B-H and B-AT/cm curves. Their effect on the design of simple magnetic circuits involving an air gap. Hysteresis. Electromagnetism. Mutual induction.

*The electric circuit.*—Kirchoff's laws. Parallel operation of batteries with unequal e.m.f. and differing internal resistances. Distribution problems. Volt-drop. Singly and doubly fed distributors. Ring mains.

*Distribution system.*—D.C. 2-wire and 3-wire. A.C. single-phase and three-phase 3-wire and 4-wire. Comparison of copper required.

Balancer in 3-wire D.C. system.

*Motor starters.*—Automatic types—reference to time and current control. The drum controller for series motors.

Applications, etc.—Parallel operation of shunt and compound generators. Equalising bar. Load sharing treated qualitatively. Applications to Ward Leonard system. Steering gear. Suitability of D.C. motors for the various types of work.

Faults and maintenance of machines. Overheating due to mechanical and electrical defects. Sparking at brushes. Loss of residual magnetism, etc. Testing machines—use of the megger.

Simple calculations on starters.

*General.*—Production of an alternating wave form. The sine law. Frequency; cycle; amplitude, instantaneous and maximum values. Relation between frequency, number of poles and speed of a machine. R.M.S. and average values. Form factor. Representation of an alternating quantity by means of vectors to give instantaneous and R.M.S. values.

*The series circuit.*—Resistance, inductance and impedance. Current and voltage relationships. Use of vectors. Power, apparent power (VA) reactive volt-ampere and power factor. The impedance triangle. Reactive and active components of current.

*The parallel circuit.*—Treatment by vectors only of fairly simple circuits. Capacitance and the application of capacitors to power factor improvement. The desirability of high power factors.

*Three-phase systems.*—Star and delta (mesh) connections for supplies and loads. Phase and line relationships. Power. Three-phase 4-wire distributor. The application to the rotating magnetic field.

*Alternators.*—Construction. E.m.f. equation. Synchronising and reference to load sharing.



*Induksiemotore.*—Konstruksie. Slip. EMK en frekwensie van rotor. Tipiese draaimoment-spoedkrommes. Bewikkelde, sleep-ring- en kooitipes. Beskrywing van tipe met dubbele wikkeling. Aansitmetodes.

*Sinchrone motore.*—Konstruksie. Aansitmetodes. Verwysing na gebruik vir arbeidsfaktor-korreksie.

*Vergelyking.*—Algemene vergelyking van een- en driefasestelsel met aanduiding van die kostebesparing van 'n driefasestelsel.

*Aandrywing.*—Tipes wat van gelykstroom- en wisselstroommasjiene gebruik maak. Turbo-elektriese aandrywings; aansitmetodes; snelheidswisseling. Voordele en nadele van elektriese aandrywing.

*Eenfasemotore.*—Beskrywing van algemene gewone tipes. Aansit.

*Transformators.*—Grondbeginsels en algemene beskrywing.

*Instrumente.*—Eenvoudige behandeling (kwalitatief) van dinamometer, wattmeter, frekwensiemeter, arbeidsfaktor-meter, draaisinchronskoop.

*Elektronika.*—Eienskappe van elektroniese kleppe en transistors, foto-elektriese effek. Effek van stroomspanning terugvoer op versterker, toevoer- en afvoerimpedansies, ekwivalente stroom.

## TWEEDE INGENIEUROFFISIER (VREEMDE VAART)—SKEEPSBOUKUNDE

(Een vraestel van 3 uur. Net 6 uit die 9 vrae moet beantwoord word)

*Algemeen.*—Verplasing. Nat vlak. Blok-, middeldeursnee-, prismatiese en watervlak-oppervlaktekoëffisiënt. Ton per sentimeter indompeling. Toepassing van Simpson se eerste reël op oppervlaktes en volumes.

*Diepgang en dryfvermoë.*—Verandering van gemiddelde diepgang as gevolg van verandering in die digtheid van water. Dryfvermoë en reserwedryfvermoë. Gevolg van lekkasie in midskepe kompartemente.

*Transversale stabiliteit.*—Verskuiwing van swaartepunt as gevolg van byvoeging of verwydering van ballas, brandstof of vrug. Stabiliteit onder klein slagsyhoëke (met die tweede oppervlaktemoment van die watervlak of formules aangegee). Die hellingstoets.

*Weerstand en aandrywing.*—Vergelyking van huidwrywingsweerstand van romp met model teen verskillende snelhede.

$RF = f \cdot S \cdot V^n$ . Admiraliteits- en brandstofkoëffisiënte. Verhouding tussen snelheid van vaartuig en brandstofverbruik met konstante verplasing en in die veronderstelling dat weerstand wissel soos (snelheid) $n$ . Elementêre behandeling van skroef. Hei, skynbare slip, werklike slip, volgstroom, stootkrag en vermoë.

*Struktuursterkte.*—Eenvoudige probleme oor sterkte van struktuurdele om vloeistofdruk te weerstaan. Belasting weens drukhoogte van vloeistof.

*Skeepsbou.*—Algemene terme gebruik by die meting van staalskepe, bv. lengte tussen loodlyne, totale breedte, holte tot opperde, diepgang en vryboord. Definisies van skeepsbouterme in algemene gebruik. Beskrywings en sketse van struktuurdele in gewone tipes staalskepe. Inrigting van masjienbedding. Waterdigte deure. Luike. Roere. Skroewe. Skroefaskokers. Waterdigte skotte. Dubbele bome. Ankers en kables. Nodige voorsorgsmaatreëls alvorens leë oliebrandstof- of ballastens binnegegaan word.

Hoe om die skip se struktuur in goeie toestand te bewaar, vernameelik die kimme, bunkers, tenks onder ketels en waterdigte deure.

Ventilasie-inrigtings (natuurlik en meganies) vir pompkamers en tenkskepe en vir ruime, kolebunkers en oliebrandstoftens. Stuwings van steenkool. Selfontbranding. Gevaar van ontploffing van gas afgegee deur steenkool.

*Induction motors.*—Construction. Slip. Reference to rotor e.m.f. and frequency. Typical torque-speed curves. Wound, slip ring and cage types. Description of double wound type. Starting methods.

*Synchronous motors.*—Construction. Starting methods. Reference to use for power factor correction.

*Comparison.*—General comparison of single and three-phase systems bringing out the saving in cost of a three-phase system.

*Propulsion.*—Types using D.C. and A.C. machines. Turbo-electric drives; starting methods; speed change. Advantages and disadvantages of electrical propulsion.

*Single-phase motors.*—Description of general common types. Starting.

*Transformers.*—Elementary principles and general description.

*Instruments.*—Simple treatment (qualitative) of dynamometer, Wattmeter, frequency meter, power factor meter, rotary synchroscope.

*Electronics.*—Characteristics of electronic valves and transistors, photo-electric effect. Effect of voltage feedback on amplifier gain, input and output impedances, equivalent circuits.

## SECOND ENGINEER-OFFICER (FOREIGN-GOING)—NAVAL ARCHITECTURE

(One paper of 3 hours, 6 questions only out of 9 to be attempted)

*General.*—Displacement. Wetted surface. Block, mid-section, prismatic and water-plane area coefficient. Tonnes per centimetre immersion. Application of Simpson's first rule to areas and volumes.

*Draught and buoyancy.*—Alteration of mean draught due to change in density of water. Buoyancy and reserve buoyancy. Effect of bilging amidship compartments.

*Transverse stability.*—Shift of centre of gravity due to addition or removal of ballast, fuel, or cargo. Stability at small angles of heel (given the second moment of area of the waterplane or formulae). The inclining experiment.

*Resistance and propulsion.*—Comparison of skin frictional resistance of hull with model at different speeds.  $R_f = f \cdot S \cdot V^n$ . Admiralty and fuel coefficients. Relation between speed of vessel and fuel consumption with constant displacement and assuming that resistance varies as (speed) $n$ . Elementary treatment of propeller. Pitch, apparent slip, real slip, wake, thrust and power.

*Structural strength.*—Simple problems on strength of structural members to resist liquid pressure. Loading due to head of liquid.

*Ship construction.*—Common terms used in the measurement of steel ships, e.g. length between perpendiculars, breadth overall moulded depth, draught and freeboard. Definitions of ship building terms in general use. Descriptions and sketches of structural members in ordinary types of steel ships. Machinery seating arrangements. Watertight doors. Hatches. Rudders. Propellers. Stern tubes. Watertight bulkheads. Double bottoms. Anchors and cables. Precautions necessary before entering empty oil fuel or ballast tanks.

The preservation in good condition of the ship's structure, in particular the bilges, bunkers, tanks under boilers and watertight doors. Ventilation arrangements (natural and mechanical) for pump rooms in tankers and for holds, coal bunkers and oil fuel tanks. Storage of coal. Spontaneous combustion. Danger of explosion from gas given off by coal.

Inrigtings vir die verklikking en blus van brand in passasiers- en vrugruimtes. Voorsorg teen brand in hawe en droogdok. Piektenks voor en agter, inrigtings vir die vulling en leegpomp van dubbele boom en dieptenk. Dreinerings van kompartemente. Inrigtings vir die nivellering van beskadigde sykompartemente.

Droogdokking en onderhoud van onderwatertoebehore.

#### HOOF-INGENIEUROFFISIER (VREEMDE VAART)—SKEEPSBOUKUNDE

(Een vraestel van 3 uur. Net 6 uit die 9 vrae moet beantwoord word)

*Algemeen.*—Vormkoeffisiënte. Natvlakformules. Eerste reël van Simpson toegepas op oppervlaktes, moment van oppervlaktes, tweede momente van oppervlaktes, volumes, momente van volumes, sentroïede en drukpunte.

*Transversale stabiliteit.*—Swaartepunt. Drukingspunt. Metasenter. Moment van statiese stabiliteit. GZ-krommes. Dwarskrommes van stabiliteit. Hidrostatiese krommes gewoonlik aan skepe verskaf. Uitwerking van vry vloei-stofoppervlak en verdeling van tenks. Gevare as gevolg van die versameling van water gedurende brandbestryding. Uitwerking van gewigte wat hang. Praktiese vereistes om stabiliteit ter see te verseker. Behartiging van water- en brandstofkenks. Vulling en lediging van tenks ter see.

*Langsstabiliteit.*—TM en SM oorlangs en statiese stabiliteit. Flottasiepunt en berekening daarvan. Moment van trimverandering met 10 mm (of 25 mm).

*Diepgang, trim en oorhelling.*—Veranderings as gevolg van byvoeging of verwydering van brandstofballas of vrag. Veranderings as gevolg van verandering in digtheid van seewater. Veranderings as gevolg van lekkasie in kompartemente, met aanwending van die metodes betreffende verlore dryfvermoë en bygevoegde gewig. Kragte op roer en spanning in roerstok. Oorhelling wanneer gedraai word, met inbegrip van uitwerking van middel-puntvliedende krag en van roer.

*Weerstand en aandrywing.*—Afleiding van Admirali-teits- en brandstofkoeffisiënte. Oorweging van totale weerstand as die som van wrywings- en remanente weerstand. Die wet van ooreenstemmende snelhede. Froude se wet van vergelyking. Eenvoudige probleme oor die voorberekening van volskaalse weerstand aan die hand van model eksperimente. Eenvoudige probleme waarby die gebruik van e.k. (effektiewe krag), g.k. (gelewerde krag) en kwasie-aandrywingskoeffisiënt. Eenvoudige probleme oor skroewe. Steekverhouding. Volgstroomfaktor. Ware slip. Skynbare slip. Stootkrag en vermoë. Kavitasie.

*Skeepsbou.*—Kragte op skip onder verskillende toestande, met inbegrip van hyging en stamp. Konstruksie van alle dele van staalskepe. Strukturele inrigtings vir beskerming teen brand. Inrigtings vir die verklikking en blus van brand. Voorsorgmaatreëls teen brand in hawe en in droogdok. Stuwings en ventilasie van steenkool. Gevaar van ontploffing van gas afgegee deur steenkool. Kim- en ballastinrigtings. Inrigtings vir die nivellering van beskadigde sykompartemente.

*Droogdokking.*—Ventilasie van ruime en oliebrandstof-tenks. Meting en klassifisering van skepe. Betekenis van "geklassifiseerde" en "ongeklassifiseerde" skepe. Drie-eiland- en skuildekskepe. Gewone terme gebruik by die meting van tonnemaat, bv. bruto tonnemaat, netto tonne-maat, toelating vir dryfkrag, tonnemaatluk.

#### TWEEDE INGENIEUROFFISIER (VREEMDE VAART) EN HOOF-INGENIEUROFFISIER (VREEMDE VAART)—INGENIEURSWESE

Kandidate vir 'n gekombineerde stoom- en motor-sertifikaat moet bereid wees om in al die items (a) tot (w) geëksamineer te word, maar kandidate sal vir 'n

Fire detection and extinction arrangements for passenger and cargo spaces. Fire precautions in port and dry dock. Fore and aft peak tanks, double bottom and deep tank filling and pumping arrangements. Compartmental drainage. Levelling arrangements for damaged side compartments.

Dry docking and maintenance of underwater fittings.

#### CHIEF ENGINEER-OFFICER (FOREIGN-GOING)—NAVAL ARCHITECTURE

(One paper of 3 hours, 6 questions only out of 9 to be attempted)

*General.*—Form coefficients. Wetted surface formulae. Simpson's first rule applied to areas, moment of areas, second moments of areas, volumes, moments of volumes, centroids and centres of pressure.

*Transverse stability.*—Centre of gravity. Centre of buoyancy. Metacentre. Moment of statical stability. GZ curves. Cross curves of stability. Hydrostatic curves commonly supplied to ship.

Effect of free liquid surface and subdivision of tanks. Dangers due to water accumulation during fire-fighting. Effect of suspended weights. Practical requirements to ensure stability at sea. Management of water and fuel tanks. Filling and emptying tanks at sea.

*Longitudinal stability.*—Longitudinal BM and GM and statical stability. Centre of flotation and its calculation. Moment to change trim by 10 mm (or 25 mm).

*Draught, trim and heel.*—Changes due to adding or removing fuel ballast or cargo. Changes due to alteration in density of sea water. Changes due to bilging of compartments, using the lost buoyancy and added weight methods. Forces on rudder and stress in rudder stock. Heel when turning, including effect of centrifugal force and of rudder.

*Resistance and propulsion.*—Derivation of Admiralty and fuel coefficients. Consideration of total resistance as the sum of frictional and residuary resistance. The law of corresponding speeds. Froude's law of comparison. Simple problems on the prediction of full scale resistance from model experiments. Simple problems involving the use of ep, dp and Q.P.C. Simple problems on propellers. Pitch ratio. Wake factor. True slip. Apparent slip. Thrust and power. Cavitation.

*Ship construction.*—Forces on ship under various conditions, including the effect of panting and pounding. Construction of all parts of steel ships. Structural fire protection arrangements. Fire detection and extinction arrangements. Fire precautions in port and in dry dock. Storage and ventilation of coal. Danger of explosion of gas given off by coal. Bilge and ballast arrangements. Levelling arrangements for damaged side compartments. Dry docking. Ventilation of holds and oil fuel tanks.

*Ship measurements and classification.*—Meaning of "classed" and "unclassed" ships. Three island and shelter deck vessels. Common terms used in tonnage measurement, e.g. gross tonnage, net tonnage, propelling power allowance, tonnage hatch.

#### SECOND ENGINEER-OFFICER (FOREIGN-GOING) AND CHIEF ENGINEER-OFFICER (FOREIGN-GOING)—ENGINEERING KNOWLEDGE

Candidates for a combined Steam and Motor Certificate must be prepared to be examined in all the items (a) to (w), but those for a Steam Certificate or the Steam Endorsement of a Motor Certificate will not be examined



stoomsertifikaat of die stoomendossement op 'n motorsertifikaat nie in items (q) tot (w) en vir 'n motorsertifikaat of die motorendossement op 'n stoomsertifikaat nie in items (j) tot (p) geëksamineer word nie. Kandidate vir die Sertifikaat van Hoof-ingenieur-offisier (Vreemde Vaart) of 'n endossement op die Sertifikaat van Hoof-ingenieur-offisier (Vreemde Vaart), van wie verwag word om 'n ruimer kennis van die verskillende items in die leerplan aan die dag te lê as kandidaat vir die Sertifikaat van Tweede Ingenieur-offisier (Vreemde Vaart) of 'n endossement op 'n Sertifikaat van Tweede Ingenieur-offisier (Vreemde Vaart), moet bereid wees om in items (x) tot (y) geëksamineer te word.

#### Opmerkings

1. Die kennis van Ingenieurswese wat deur kandidaat aan die dag gelê moet word, is dié wat vereis word vir die gebruik, bediening en onderhoud van die masjinerie, toerusting en skeepsdele waarvoor die Ingenieur-offisier gewoonlik verantwoordelik is. Ook word kennis vereis van die metodes om die verskillende onderdele te vervaardig.

2. Kandidaat vir sertifikate en endossemente moet 'n skriftelike en daarna 'n mondelinge eksamen aflê.

3. Die skriftelike eksamen vir 'n stoom- of motorsertifikaat bestaan uit 2 vraestelle van 3 uur elk. In elke vraestel moet net 6 uit die 9 vrae beantwoord word.

4. Die skriftelike eksamen vir 'n gekombineerde stoom- en motorsertifikaat bestaan uit 3 vraestelle van 3 uur elk. In elke vraestel moet net 6 uit die 9 vrae beantwoord word.

5. Die skriftelike eksamen vir 'n stoom- of motorendossement bestaan uit 1 vraestel van 3 uur en hierin moet net 6 uit die 9 vrae beantwoord word.

6. Waar daar in die eksamen vir 'n Sertifikaat van Hoof-ingenieur-offisier (Vreemde Vaart) of 'n endossement op 'n Sertifikaat van Hoof-ingenieur-offisier (Vreemde Vaart) vrae oor hoof-elektriese aandryfmasjinerie gevra word, word die 9 vrae vermeerder met die getal vrae oor hoof-elektriese aandryfmasjinerie.

7. Kandidaat kan versoek word om hul antwoorde met sketse toe te lig.

(a) Die verskillende behandelings se algemene uitwerking op die fisiese eienskappe van materiale wat algemeen by die bou van skeepsmasjiene en -ketels gebruik word, en die meganiese toetse waaraan hierdie materiale gewoonlik onderwerp word.

(b) Warmte en verbranding. Die eienskappe van stoom, brandstof, smeermiddels en ander vloeistowwe, gasse en dampe wat in masjinerie op 'n skip gebruik word.

(c) Die gebruik, konstruksiebesonderhede en beginsels betrokke by die werking van die drukmeter, voltmeter, ammeter, termometer, pirometer, barometer, salinometer, hidrometer en ander meters wat algemeen deur ingenieurs op 'n skip gebruik word.

(d) Die oorsake, uitwerking en gewone middels teen ketelsteenvorming en korrosie. Voedingswater en blaasdigtheide, en ketelsteenvorming.

(e) (1) Konstruksiebesonderhede en werkbeginnels van skeepsmasjiene; metodes om hul krag te bepaal. Die beginsel waarvolgens dinamometers en wringingsmeters werk en metodes vir hul yking.

(2) Die metodes om met slytasie in masjinerie en ketels te handel. Die rig van masjiendele. Die verhelping van defekte as gevolg van gebreke in die materiaal of 'n ongeluk. Tydelike of permanente herstelwerk in die geval van ontwrigting of algehele onklarheid.

(f) Konstruksiebesonderhede en werkingsbeginnels van sentrifugale-, klepsuier- en perspompe. Die algemene vereistes met betrekking tot toevoer-, brandstof-, lens- en ballaspompstelsels.

in items (q) to (w) and those for a Motor Certificate or the Motor Endorsement of a Steam Certificate will not be examined in items (j) to (p). In addition, candidates for a certificate of Chief Engineer-Officer (Foreign-going) or an endorsement of a certificate of Chief Engineer-Officer (Foreign-going), who will be expected to display a fuller knowledge of the different items in the Syllabus than candidates for a certificate of Second Engineer-Officer (Foreign-going) or an endorsement of a certificate of Second Engineer-Officer (Foreign-going) must be prepared to be examined in items (x) to (y).

#### Notes

1. The Engineering Knowledge to be shown by candidates is that which is required for the use, operation and maintenance of the machinery, equipment and ship structure usually in the charge of the Engineer-Officer. A knowledge of the methods of manufacture of the various components is also required.

2. Candidates for certificates and endorsements are required to take a written examination followed by an oral examination.

3. The written examination for a Steam or Motor Certificate consists of 2 papers of 3 hours each—6 questions only to be attempted out of 9 in each paper.

4. The written examination for a combined Steam and Motor Certificate consists of three papers of 3 hours each—6 questions only to be attempted out of 9 in each paper.

5. The written examination for a Steam or Motor Endorsement consists of one paper of 3 hours—6 questions only to be attempted out of 9 in the paper.

6. Where questions relating to main electric propelling plant are asked in the examination for a certificate of Chief Engineer-Officer (Foreign-going) or an endorsement of a certificate of a Chief Engineer-Officer (Foreign-going), the 9 questions set will be increased by the number of questions set on main electric propelling plant.

7. Candidates may be required to illustrate their answers by means of sketches.

(a) The general effects of the various treatments on the physical properties of materials commonly used in the construction of marine engines and boilers, and the mechanical tests to which these materials are normally subjected.

(b) Heat and combustion. The properties of steam, fuel lubricants and other liquids, gases and vapour used in machinery on board ship.

(c) The use, constructional details and principles involved in the action of the pressure gauge, voltmeter, ammeter, thermometer, pyrometer, barometer, salinometer, hydrometer and other meters commonly used by engineers on board ship.

(d) The causes, effects and usual remedies for incrustation and corrosion. Feed water and blow densities, and scale formation.

(e) (1) Constructional details and working principles of marine engines; methods of determining their power. The principle of working and methods of calibration of dynamometers and torsion meters.

(2) The methods of dealing with wear and tear of machinery and boilers. The alignment of machinery parts. The correction of defects due to flaws in material or accident. Temporary or permanent repairs in the event of derangement or total breakdown.

(f) Constructional details and principles of action of centrifugal, bucket and force pumps. The general requirements concerning feed, fuel, bilge and ballast pumping systems.

(g) Die boukundige inrigting, besonderhede en werking van stuurmasjiene en sturgerei, koelmasjiene, hidrouliese masjiene en sodanige stoom- en binnebrandmasjiene as wat as nood- en hulpmasjiene aan boord gebruik word.

(h) Aanwending van die indikateur. Berekening van gemiddelde druk en krag. Wisseling van druk in silinder soos deur indikateurdiagramme aangetoon.

(i) (1) Voorsorgmaatreëls teen brand of ontploffings as gevolg van olie of gas. Flitspunt. Ontploffbaarheid van gas of damp afgegee deur brandstof of smeerolies wanneer dit met 'n hoeveelheid lug gemeng is. Die gevaar van lekkasie uit olietenks, pype, gasontwikkelaars en verdampers, vernameklik in kimme en ander ongeventileerde ruimtes. Die werking van draadgaasdiaphragmas en die plekke waar sulke inrigtings aangebring behoort te word.

(2) Selfontbranding van steenkool. Ontploffbaarheid van gas afgegee deur steenkool. Ventilasië en stuwings van steenkool.

(3) Brandopsporing. Metodes van brandbestryding. Werking en onderhoud van meganiese en chemiese brandblussers en ander brandbestrydingstoestelle, gasmaskers en veiligheidslampe.

(j) Die metodes om skeepstoommasjiene en stoomketels te bou, die prosesse waaraan die verskillende dele onderwerp word of wat met hul vervaardiging gepaard gaan, en die metodes wat by die montering van die masjinerie op 'n skip aangewend word.

(k) Die verskillende tipes aandryf- en hulpstoommasjiene tans in gebruik, die funksies van elke belangrike deel en die aandag wat deur die verskillende dele van die masjinerie op 'n skip vereis word.

(l) Die metodes om stoominlaat- en -uitlaatkleppe te toets en te verstel en die wyse waarop die werking van die masjiene deur besliste verstelling van die kleppe beïnvloed word.

(m) Die konstruksiebesonderhede en werking van verdampers, voedingswaterverwarmers en voedingswaterfilters.

(n) Skeepsketels van verskillende moderne ontwerpe; die manier om hulle te stut, asook die voorkoming van verskuiwing van ketels wanneer vaartuie hei of rol. Bepaling, deur berekening, van geskikte werkdrukke vir ketels met verstrekte afmetings.

(o) Die gebruik en hantering van keteltoebehore en -monterings, veral watermeters en veiligheidskleppe. Nodige voorsorgmaatreëls wanneer stoom opgewek en met afsluitkleppe gewerk word, veral met betrekking tot die gevaar wat deur waterslag veroorsaak word.

(p) Konstruksiebesonderhede, werking en onderhoud van installasies wat algemeen gebruik word om lugtrek, oorverhitting van stoom en die verbranding van steenkool of oliebrandstof aan te help.

(q) Die beginsels ten grondslag van binnebrandmasjiene. Die verskil tussen verskillende tipes masjiene. Konstruksiebesonderhede van binnebrandmasjiene wat algemeen in gebruik is.

(r) Die aard en eienskappe van die brand- en smeerolies wat gewoonlik in binnebrandmasjiene gebruik word. Die toevoer van lug en brandstof na silinders van masjiene van verskillende tipes. Die konstruksiebesonderhede van apparaat vir die vergassing of verstuiwing van brandstof. Die metodes om silinders en suiers te verkoel. Konstruksiebesonderhede en werking van lugkompressors.

(s) Die metodes vir die bou van skeepsbinnebrandmasjiene. Die prosesse waaraan die verskillende dele onderwerp word of wat met hul vervaardiging gepaard gaan, en die metodes wat by die montering van die masjinerie op 'n skip aangewend word.

(t) Aansit- en omstelinrigtings en die verskillende handelings wat daarmee in verband staan.

(g) The constructional arrangement, details and working of steering-engines and gears, refrigerating machinery, hydraulic machinery, and such steam and internal combustion engines as are used for emergency and auxiliary machinery on board ship.

(h) Application of the indicator. Calculation of mean pressure and power. Fluctuation of pressure in the cylinder as shown by indicator diagrams.

(i) (1) Precautions against fire or explosions due to oil or gas. Flash point. Explosive properties of gas or vapour given off by fuel or lubricating oils when mixed with a quantity of air. The danger of leakage from oil tanks, pipes, gas producers and vaporisers, particularly in bilges and other unventilated spaces. The action of wire gauze diaphragms and the places in which such devices should be fitted.

(2) Spontaneous combustion of coal. Explosive properties of gas given off by coal. Ventilation and storage of coal.

(3) Fire detection. Methods of dealing with fire. Action and maintenance of mechanical and chemical fire extinguishers and other fire-fighting appliances, respirators and safety lamps.

(j) The methods of constructing marine steam engines and boilers, the processes to which the several parts are submitted, or which are incidental to their manufacture, and the methods employed in fitting the machinery on board ship.

(k) The various types of propelling and auxiliary steam engines now in use, the functions of each important part and the attention required by the different parts of the machinery on board ship.

(l) The methods of testing and altering the setting of the steam admission and exhaust valves, and the effect produced in the working of the engine by definite alterations in the settings of the valves.

(m) The constructional details and working of evaporators, feed water heaters and feed water filters.

(n) Marine boilers of various modern designs; the manner of staying them, and also the prevention of movement of boilers when vessels are pitching or rolling. The determination by calculation of suitable working pressures for boilers of given dimensions.

(o) The use and management of boiler fittings and mountings, with special reference to water gauges and safety valves. Precautions necessary when raising steam and operating stop valves, with particular reference to the danger arising from water hammer action.

(p) Constructional details, operation and maintenance of installations generally employed for assisting draught, superheating steam and burning coal or oil fuel.

(q) The principles underlying the working of internal combustion engines. The difference between various types of engines. Constructional details of internal combustion engines in general use.

(r) The nature and properties of the fuel and lubricating oils generally used in internal combustion engines. The supply of air and fuels to cylinders of engines of different types. The constructional details of apparatus for carburetting or atomising the fuel. The means of cooling the cylinders and pistons. Constructional details and working of air compressors.

(s) The methods of constructing marine internal combustion engines. The processes to which the several parts are submitted or which are incidental to their manufacture, and the methods employed in fitting the machinery on board ship.

(t) Starting and reversing arrangements and the various operations connected therewith.



(u) Die aandag wat vir die werking en onderhoud van die verskillende dele van masjinerie nodig is. Die gebruik en hantering van kleppe, pype, verbindings en veiligheids-toestelle wat gebruik word.

(v) Opnoeming en beskrywing van defekte wat uit werking van masjinerie ontstaan. Die verhelping van sulke defekte.

(w) Konstruksiebesonderhede en hantering van hulpstoomketels, hul toebehore en monterings, veral waterpeilglase en veiligheidskleppe. Konstruksiebesonderhede en hantering van hulpmasjinerie.

#### KANDIDAAT VIR SERTIFIKAAT VAN HOOF-INGENIEUROFFISIER (VREEMDE VAART) EN ENDOSSEMENT OP SODANIGE SERTIFIKAAT

(x) Die administratiewe pligte van 'n Hoof-ingenieur-offisier (Vreemde Vaart): Organisering van sy personeel vir noodpligte en gebruik van veiligheidsuitrusting; organisering van herstelwerk en ondersoek. Verslae aan eienaars. Die onderhoud en werkende toestand van masjinerie en toestelle wat onder die sorg van 'n Senior Ingenieur-offisier geplaas word. Die nodige aandag om onklarheid en defekte te voorkom. Die gewone herstelwerk en vernuwings wat nodig is; toesig oor en inspeksie van masjinerie en ketels op 'n skip. Gereedmaking van ketels en masjinerie vir ondersoek.

(y) Die bespeuring van onreëlmatigheid in die loop van masjiene aan die hand van indikateurdiagramme. Die verhelping van hierdie onreëlmatighede. Toeligting, deur middel van sketse, van die verandering in die diagram as gevolg van verstelling of 'n verandering in die werking van die kleppe of ander faktore.

#### *Mondelinge eksamen*

Die mondelinge eksamen sal grotendeels op die praktiese kennisvakke van die eksamen gebaseer word en sal vroeë insluit oor die hantering van masjiene en ketels ter see, die pligte van 'n toesighoudende ingenieur, die werk wat in 'n hawe aan masjiene, ketels en hulpmasjiene gedoen moet word, en die periodieke ondersoek van die werkende dele.

Kandidate moet ook goed vertrou wees met foute wat ter see in masjiene en ketels kan voorkom, en moet in staat wees om te verduidelik hoe sulke foute voorkom en herstel kan word.

#### AANHANGSEL 4

#### LEERPLAN VIR DIE EKSAMEN VAN HOOF-INGENIEUROFFISIER—SPESIALE GRAAD

Daar word van kandidate verwag om 'n uitgebreide kennis van al die items in die leerplanne vir Tweede Ingenieur-offisier (Vreemde Vaart) en Hoof-ingenieur-offisier (Vreemde Vaart) se eksamens aan die dag te lê.

#### INGENIEURSKENNIS

Daar word vroeë gestel om die kandidaat se kennis te toets van tegnologiese ondersoek wat die ingenieurspraktiek beïnvloed het en belangrike ontwikkelings wat daaruit voortgespruit het sonder die beperkings van die eksamenleerplanne vir Tweede Ingenieur-offisier (Vreemde Vaart) en Hoof-ingenieur-offisier (Vreemde Vaart).

#### MASJINLEER (HIDROMEGANIKA)

Vlakkinematika van eenvoudige meganismes. Oombliklike rotasiesenters. Relatiewe snelheid van masjiendele volgens berekening en grafiese metodes. Verplasing-, snelheids- en versnellingsdiagramme. Berekening van verplasingssnelheid en versnelling van skuifkrukmeganismes. Nokke. Vorm- en werkingsleer van rattande. Heliese, keëlwurm, reguittandratandrywing en ratstelle. Inersiekragte op enjinmeganismes. Balansering van roterende massas, primêre balansering van suierdele, sekondêre balansering

(u) The attention required for the operation and maintenance of the various parts of machinery. The use and management of valves, pipes, connections and safety devices employed.

(v) Enumeration and description of defects arising from working of machinery. The rectification of such defects.

(w) Constructional details and management of auxiliary steam boilers, their fittings and mountings, with special reference to water gauges and safety valves. Constructional details and management of auxiliary machinery.

#### CANDIDATE FOR A CERTIFICATE OF CHIEF ENGINEER-OFFICER (FOREIGN-GOING) AND ENDORSEMENT OF SUCH CERTIFICATE

(x) The administrative duties of a Chief Engineer-Officer (Foreign-going): Organisation of his staff for emergency duties and the use of safety equipment: organisation of repairs and surveys. Reports to owners. The maintenance and working condition of machinery and appliances placed in the charge of a Senior Engineer-Officer. The attention required to prevent breakdowns and defects. The usual repairs and renewals required; supervision and inspection of machinery and boilers on board ship. Preparation of boilers and machinery for survey.

(y) The recognition of irregularity in the running of engines from indicator diagrams. The rectification of these irregularities. Illustration by means of sketches of the change produced in the diagram due to an alteration in the setting or working of the valves or any other factors.

#### *Oral examination*

The oral examination will be largely based upon the Practical Knowledge subjects of the examination and will include questions on the management of engines and boilers at sea, the duties of the supervising engineer, the work to be done on engines, boilers and auxiliary machinery in port and the periodical examination of the working parts.

Candidates should also be well acquainted with machinery and boiler casualties which may occur at sea and should be able to state how these may be prevented and remedied.

#### ANNEXURE 4

#### SYLLABUS FOR THE EXAMINATION OF CHIEF ENGINEER-OFFICER—SPECIAL GRADE

Candidates are expected to show a more extensive knowledge of all the items in the syllabuses for the examination of Second Engineer-Officer (Foreign-going) and Chief-Engineer-Officer (Foreign-going).

#### ENGINEERING KNOWLEDGE

Questions will be set to test the candidate's knowledge of technological investigations which have influenced engineering practice and important developments arising therefrom free from the limitations of the examination syllabuses for Second Engineer-Officer (Foreign-going) and Chief Engineer-Officer (Foreign-going).

#### THEORY OF MACHINES (MECHANICS OF FLUIDS)

Plane kinematics of simple mechanisms. Instantaneous centres of rotation. Relative velocity of machine parts by calculation and graphic methods. Displacement, velocity and acceleration diagrams. Calculation of displacement velocity and acceleration of slider crank mechanisms. Cams. Theory of shape and action of gear teeth. Helical, bevel worm, spur gearing and gear trains. Inertia forces on engine mechanisms. Balancing of rotating masses,

van gelidenjins. Draaimomentdiagramme. Vliegwiele. Reëlaars. Trillings van meganiese stelsels insluitende geforseerde trilling en die effek van viskeuse damping. Torsie-ossillasies van asse. Werweling van asse.

Giroskoopleer en -werking.

Wrywing, band-, tou- en kettingaandrywing, koppelaars. Smering, leer van grenslaagsmering, koeël- en rollaars.

*Hidrostatika*.—Fundamentele eienskappe van vloeistowwe. Viskositeit, oppervlakspanning. Resulterende druk op vlakoppervlakte en op die vlak van enkelkromming, druksenter. Vertikale stabiliteit van die atmosfeer.

*Hidrodinamika*.—Stroomlyn-laminêre en turbulente stromings, invloed van soliede grense op vloeistofbeweging. Bernoulli se wet, kontinuïteit van stroming. Verdeling van druk en snelheid in vry en geforseerde vortekse. Weerstand van viskeuse vloeistof in stroomlyn- of turbulente beweging. Gebruik van koeffisiënte om weerstand- en stroomlynkrimpings te korregeer. Meet van snelheid van onsaam-drukbare stroming deur pitot- en statiese drukbuise, openinge, kepe en venturimeter. Drukverlies as gevolg van buigings, skielike vergrotings en krimpings-hidrouliese gradiënt. Dinamiese gelykvormigheid. Stroming tussen parallelle vlakke en in ronde pype. Kritieke snelhede vir stroming in pype. Reynolds-getal, Rayleigh se formules. Water-slag. Slag en reaksie van stralers. Die leer van sentrifugale pompe, suierpompe, akkumulators en ander hidrouliese masjiene vir skeepswerking.

## STERKTELEER EN EIENSKAPPE VAN MATERIALE

*Spanning en vervorming*.—Hooke se wet. Komplementêre skuifspanning. Elastisiteitsmodulus. Vastheidsmodulus; Poisson se verhouding. Verhouding tussen elastiese konstantes. Temperatuurspannings. Komplekse spanningstelsels. Hoofspannings en vervormings. Veerkrag, vervormingsenergie. Slagbelasting. Teorieë van elastiese weiering.

Skuifkrag. Buigmomente, helling en defleksie in vrysteun- en ingeboude balke en vrydraers. Verdeling van spanning in balke. Blad- en plat spiraalvere.

Style onder aksiale en parallelle eksentriese belastings.

Spannings en vervormings in dun- en dikwandsilinders onder vloeistofdruk. Samegestelde silinders.

Wringing van asse, kragtransmissie deur asse. Heliese toespoel- en oopspoelvere.

Spanning en defleksie in raamwerk wat analities en grafies behandel word. Meganiese eienskappe van materiale, samestelling en eienskappe van die belangrike ysterhoudende en nie-ysterhoudende metale. Termiese ewewigdiagramme, yster, koolstofdiagramme, mikrostrukture en makrostrukture. Hittebehandeling en gebruik van gewone en legeringstaal. Gietysters insluitende hoëdiens- en smeebare tipes. Gietegniek van ysterhoudende en nie-ysterhoudende metale. Vervaardiging van gietblokke en hulle defekte. Effekte van koudbewerking. Kruip en vermoedheid van metale. Korrosie en korrosiebeskerming. Sweisprosedure en ondersoek van sweislasse. Nie-destruktiwe metodes van metaaltoetsing. Gewone tipes toetsmasjiene en -instrumente. Materiaaltoetsprosedure.

## TOEGEPASTE TERMODINAMIKA

Die eienskappe van gasse en dampe insluitende wisselende soortlike hitte. Termodinamikawette. Interne energie, totale hitte en entropie. Mengsels van gasse en dampe. Gedeeltelike druk.

Die Carnot-siklus, omstelbare en nie-omstelbare prosesse.

Die voorstelling van versnelling-, isotermiese, adiabatiese, isentropiese en politropiese prosesse op energiekaarte.

primary balancing of reciprocating parts, secondary balancing of "in line" engines. Turning moment diagrams. Flywheels. Governors. Vibrations of mechanical systems including forced vibration and the effect of viscous damping. Torsional oscillations of shafting. Whirling of shafts.

Gyroscopic theory and action.

Friction, belt, rope and chain drives, clutches.

Lubrication, theory of boundary film lubrication, ball and roller bearings.

*Hydrostatics*.—Fundamental properties of fluids. Viscosity, surface tension. Resultant pressure on plane surfaces and on surfaces of single curvature, centre of pressure. Vertical stability of the atmosphere.

*Hydrodynamics*.—Streamline, laminar and turbulent flow, influence of solid boundaries on fluid motion. Bernoulli's principle continuity of flow. Distribution of pressure and velocity in free and forced vortices. Resistance of viscous fluid in streamline or turbulent motion. Use of coefficients to correct for resistance and streamline contraction. Measurement of velocity of incompressible flow by pitot and static pressure tubes, orifices, notches and Venturi meter. Loss of head due to bends, sudden enlargements and contractions-hydraulic gradient. Dynamical similarity. Flow between parallel surfaces and in circular pipes. Critical velocities for flow in pipes. Reynolds's number, Rayleigh's formulae. Water-hammer. Impact and reaction of jets. Theory of centrifugal pumps, reciprocating pumps, accumulators and other hydraulic machines with a marine application.

## STRENGTH AND PROPERTIES OF MATERIALS

*Stress and Strain*.—Hooke's law. Complementary shear stress. Modulus of elasticity. Modulus of rigidity; Poisson's ratio. Relationships between the elastic constants. Temperature stresses. Complex stress systems. Principal stresses and strains. Resilience, strain energy. Impact loading. Theories of elastic failure.

Shearing force. Bending moments, slope and deflection in freely supported and built-in beams and cantilevers. Distribution of stress in beams. Leaf and flat spiral springs.

Struts subjected to axial and parallel eccentric loadings. Stresses and strains in thin walled and thick walled cylinders under fluid pressure. Compound cylinders.

Torsion of shafts, transmission of power by shafting. Close coiled and open coiled helical springs.

Stress and deflection in frameworks treated analytically and graphically. Mechanical properties of materials, composition and properties of the important ferrous and non-ferrous metals. Thermal equilibrium diagrams, iron carbon diagrams, microstructure and macrostructure. Heat treatment and uses of plain and alloy steels. Cast irons including high duty and malleable types. Casting technique for ferrous and non-ferrous metals. Production of ingots and their defects. Effects of cold working. Creep and fatigue of metals. Corrosion and corrosion protection. Welding procedure and examination of welds. Non-destructive methods of metal testing. Common types of testing machines and instruments. Material testing procedure.

## APPLIED THERMODYNAMICS

The properties of gases and vapours including variable specific heats. Laws of thermodynamics. Internal energy, total heat and entropy. Mixtures of gases and vapours. Partial pressures.

The Carnot cycle, reversible and irreversible processes.

The representation of throttling, isothermal, adiabatic, isentropic and polytropic processes on energy charts.



Ideale lug- en dampsiklusse vir primêre kragbronne, kompressors en verkoelers; die voorstelling daarvan op energiekaarte. Rendementsberekenings. Stroming van gasse en dampe deur nossels en blaasies.

Elementêre hitteoordrag insluitende geleiding deur saamgestelde wande. Verbranding. Eienskappe van vaste, vloeistof-, en gasbrandstowwe. Kalorimetrie. Die effekte van wisselende lugtoevoer. Ontleding van verbrandingsprodukte.

#### SKEEPSHITTEWERKTUIG

Toets en rendement van ketelinstallasies. Lugtoevoer en -reëling. Kondensators, toevoerverhitters, onlugters, bespaarders, lugverhitters, superverhitters, nabranders, toevoerstelsels, verdampers.

Praktiese stoommasjiensiklusse. Effekte van superverhitting, nabranding en toevoerverhitting. Rendemente. Turbinenossel- en bladberekenings. Die suierstroomenjin. Saamgestelde instelling.

Praktiese binnebrandenjinsiklusse. Verbranding. Effekte van dissosiasie en wisselende soortlike hitte.

Verkoeling insluitende meereffekverdamper. Hittepomp-siklusse. Koolsuurgas-, ammoniak-, metielchloried-, Arcton- en swaeldioksiedstelsels.

Lugkompressors, lugmotors. Suier- en draaimasjiene. Gasturbines, siklusse en rendemente.

Die toets en prestasie van skeepshitte-enjins.

#### OPSTEL

Die doel met die opstel is om die kandidaat se bekwaamheid te toets om goeie grammatiese Engels of Afrikaans saam te stel en te skryf en om hulle menings, bevindings en wenke uit te druk in behoorlik geskrewe verslae, besigheidsbriewe of opstelle oor onderwerpe wat in verband staan met die professie of van 'n meer algemene belang.

Daar word 2 onderwerpe gegee; slegs 1 moet beantwoord word.

#### INGENIEURSTEKENE EN -ONTWERP

Die opstel van 'n werktekening van enige deel van skeepsmasjinerie, ketels, meganiese uitrusting of dele van skeepstruktuur wat meebring die rangskikking van samestellende dele uit gegewe besonderhede, en ontwerp-berekenings wat gevra word.

Daar word twee onderwerpe gegee; slegs een moet beantwoord word.

#### ELEKTROTEGNOLOGIE

*Elektromagnetisme.*—Magnetiese eienskappe van ferromagnetiese materiaal, berekening van ampêrewindings vir saamgestelde magnetiese kringe, energie opgegaar in magnetiese veld, self- en onderlinge induktansie, effek van induktansie of kapasitansie op gelykstroomkringe.

*Elektrostatika.*—Algemene beginsels van elektrostatika. Intensiteit en sterkte van elektriese velde. Stellings van Gauss en Coulomb. Potensiaal en kapasitansie, potensiaal-gradiënt. Kondensators—lading en ontlading van kondensators insluitende osillatorlading en ontlading. Beginsels van diëlektrika.

*Gelykstroommasjiene.*—Bou van gelykstroommasjiene. Wikkellings asook meerdraaiwikkellings. Ewenaarlinge. Kommutasie. Ankerreaksie, hulppole. Eienskappe van alle tipes gelykstroommotors en generators. Motorspoed en—draaimoment, -motoraansit en kontrole. Eenvoudige kwalitatiewe behandeling van die amplituden en metadien, toepassing van amplituden en metadien op spoed-, stroom- en spanningbeheer. Werking van gelykstroomgenerators in serie en parallel. Toets van gelykstroommasjiene, direkte en indirekte metodes—skeiafstand van verliese, verbraging- en regeneratiewe toetsmetodes. Verdeling van gelykstroom-, dieldraad-, balanseerder, aanjaer, en ringhoofleidingstelsels.

Ideal air and vapour cycles for prime movers, compressors and refrigerators; their representation on energy charts. Efficiency calculations. Flow of gases and vapours through nozzles and blading.

Elementary heat transfer including conduction through composite walls. Combustion. Properties of solid, liquid and gaseous fuels. Calorimetry. The effects of varying air supply. Analysis of combustion products.

#### MARINE HEAT ENGINES

Boiler plant testing and efficiency. Air supply and regulation. Condensers, feed heaters, de-aerators, economisers, air heaters, superheaters, reheaters, closed feed system, evaporators.

Practical steam engine cycles. Effects of superheating reheating and feed heating. Efficiencies. Turbine nozzle and blade calculations. The reciprocating steam engine. Compounding.

Practical internal combustion engine cycles. Combustion. Effects of dissociation and variable specific heats.

Refrigeration, including, multiple effect evaporation. Heat pump cycles. Carbon dioxide, ammonia, methyl chloride, arcton and sulphur dioxide systems.

Air compressors, air motors. Reciprocating and rotary machines. Gas turbines, cycles and efficiencies.

The testing and performance of marine heat engines.

#### ESSAY

The purpose of the essay is to test the candidates' ability to compose and write good grammatical English or Afrikaans and to express their opinions, conclusions and suggestions in suitably written reports, business letters or essays on subjects connected with the profession or of a more general interest.

Two subjects will be given; only one is to be attempted.

#### ENGINEERING DRAWING AND DESIGN

To produce a working drawing of any part of marine machinery, boilers, mechanical equipment or parts of ship structure involving the arrangement of constituent members from given particulars and the design calculations asked for.

Two subjects will be given; only one is to be attempted.

#### ELECTROTECHNOLOGY

*Electromagnetism.*—Magnetic properties of ferromagnetic material, calculation of ampere turns for composite magnetic circuits, energy stored in magnetic field, self and mutual inductance, effect of inductance or capacitance on D.C. circuits.

*Electrostatics.*—General principles of electrostatics. Intensity and strength of electric field. Theorems of Gauss and Coulomb. Potential and capacitance. Potential gradient. Condensers—charge and discharge of condensers including oscillatory charge and discharge. Principles of dielectrics.

*D.C. Machines.*—Construction of D.C. machines. Windings, including multi-turn windings. Equaliser rings. Commutation armature reaction, interpoles. Characteristics of all types of D.C. motors and generators. Motor speed and torque-motor starting and control. Simple qualitative treatment of the amplidyne and metadyne, application of amplidyne and metadyne to control of speed, current and voltage. Operation of D.C. generators in series and parallel. Testing of D.C. machines, direct and indirect methods—separation of losses, retardation and regenerative methods of testing. Distribution of D.C. current, 3-wire system, balancers, boosters, rating main system.

**Wisselstroom.**—Opwekking van sinusvormige elektromotoriese, kraggolfvorm, amplitude en frekwensie. Waardes sinusvormige stroom en spanning. Berekenings op eenvoudige kringe insluitende weerstand, kapasitansie, induktansie en resonansie. Vektorvoorstelling. Arbeidsfaktor. Enkel- en driefasekringe met ster- en deltaverbindings. Krag- en energiemeting in gebalanseerde driefasekringe. Transformatore, transformasieverhoudings, vektordiagramme, spanningsreëling en -rendement.

**Wisselstroommasjiene.**—Vloedverdeling in uitspringende pool- en nie-uitspringende poolvelde. Elektromotoriese krag opgewek in spoel en verdeelde wikkelsings. Alternators en hulle gebruik as sinchrone motore. Polifase-inlaatsmotore, teorie, eienskappe en aansitreefings. Parallele werking van wisselstroomaltematore en -instrumente. Gelykrygters vir wisselstroomkragkringe.

**Elektronika.**—Die vakuumdiod- en -triodebuis. Elementêre beskrywing van katodestraalbuis, transistors, gelykrygters, elementêre behandeling van versterkerstrome.

**Verligting.**—Elektriese gloeidraad- en gasontladingslampe.

## SKEEPSBOUKUNDE

Afleiding van Simpson en Tchebycheff se wette.

**Stabiliteit.**—Hidrostatisiese krommes, statistiese krommes en dwarskrommes van stabiliteit.

**Dinamiese stabiliteit.**—Vryvlakprobleme. Gronding.

**Onderverdeling van passasierskepe.**—Onderwaterlengtekrommes en die gebruik daarvan.

**Sterkte van skepe.**—Die trogoïdale golfteorie. Plaaslike en langsterkteberekenings. Statiese sterkte grafies en deur berekening handel. Dinamiese effekte. Ossilasie, rol en hei van skepe. Eenvoudige kwaliteitsbehandeling van trillings.

**Weerstand en aandrywing van skepe.**—Model eksperimente en wette van vergelyking. Dinamiese gelykvormigheid. Viskositeit en die effekte daarvan op vloeistofwrywing. Dimensionele ontleding en die nie-dimensionele faktorbenadering van Reynolds- en Froude-getalle. Ander metodes vir bepaling van krag, bv. Admiraliteitskoëffisiëntformule, Taylorkrommes. Kringkonstantes en die gebruik daarvan.

**Skroewe, meetkunde van die heliks, tipiese snelheidsdriehoek wat skeepshelling en invalshoek insluit. Stukrag, draaimoment en rendement. Bladelementteorie—hefkrag en sleur op stroombladvak. Aksiale momentum. Skroefkoëffisiënte en die gebruik daarvan. Kavitasie. Wisselwerking tussen skroef en skip. Romprendement en sy faktore. Totale aandrywingskoëffisiënt.**

**Materiaal gebruik by skeepsbou.**—Staal, aluminium, keepverbrissing.

**Klassifikasieverenigingsreëls.**—Moderne ontwikkeling in strukturele ontwerp. Diskontinuiteite. Die gebruik van sweis. Korrosie en aangroeiels.

**Algemene beginsels van laslyntoewysing en tonnemaatmetings.**

## AANHANGSEL 5

### REPUBLIEK VAN SUID-AFRIKA

BEKWAAMHEIDCERTIFIKAAT AS  
INGENIEUROFFISIER VAN 'N  
TOEGERUS MET

**Alternating current.**—Generation of sinusoidal e.m.f. wave form amplitude and frequency. Values sinusoidal current and voltage. Calculations on simple circuits involving resistance, capacitance, inductance and resonance. Vector representation. Power factor, single and three-phase circuits with star and delta connections. Power and energy measurement in three-phase balanced circuits. Transformers, transformation ratios, vector diagrams, voltage regulation and efficiency.

**A.C. machines.**—Flux distribution in salient pole and non-salient pole fields. E.m.f. generator in coils and distributed windings. Alternators and their use as synchronous motors. Polyphase induction motors, theory, characteristics and starting arrangements. Parallel operation of A.C. alternators and instruments. Rectifiers for A.C. power circuit.

**Electronics.**—The vacuum diode and triode valves. Elementary description of cathode-ray tube, transistors, rectifiers, elementary treatment of amplifier currents.

**Illumination.**—Filament and gas discharge type of electric lamps.

## NAVAL ARCHITECTURE

Derivation of Simpson's and Tchebycheff's rules.

**Stability.**—Hydrostatic curves, statical curves and cross curves of stability.

**Dynamical stability.**—Free surface problems. Grounding.

**Subdivision of passenger ships.**—Floodable length curves and their use.

**The strength of ships.**—The trochoidal wave theory. Local and longitudinal strength calculations. Statical strength treated graphically and by calculation. Dynamical effects. Oscillation rolling and pitching of ships. Simple qualitative treatment of vibrations.

**Resistance and propulsion of ships.**—Model experiments and laws of comparison. Dynamical similarity. Viscosity and its effects on fluid friction. Dimensional analysis and the non-dimensional factor approach to Reynolds's and Froude's numbers.

Other methods of estimating power, e.g. Admiralty coefficient formula, Taylor's curves. Circular constants and their use.

**Propellers, geometry of the helix, typical triangle of velocities introducing slip and angle of incidence. Thrust, torque and efficiency. Blade element theory—lift and drag on aerofoil section. Axial momentum. Propeller coefficients and their use. Cavitation. Interaction between screw and ship. Hull efficiency and its factors. Overall propulsion coefficient.**

**Materials used in ship building.**—Steel, aluminium notch embrittlement.

**Classification societies' rules.**—Modern developments in structural design. Discontinuities. The employment of welding. Corrosion and fouling.

**General principles of load line assignment and tonnage measurements.**

## ANNEXURE 5

### REPUBLIC OF SOUTH AFRICA

CERTIFICATE OF COMPETENCY AS  
ENGINEER-OFFICER OF A  
FITTED WITH



## AANDRYFMASJINERIE

No. ....

Aan .....

Nademaal u aan al die vereistes wat by wet voorgeskryf is vir die verlening aan u van 'n bekwaamheidsertifikaat as .....

Ingenieuroffisier van 'n .....

toegerus met ..... aandryfmajinerie, voldoen het, word hierdie sertifikaat kragtens artikel ..... van die Handelskeepvaartwet, 1951 (Wet 57 van 1951), soos gewysig, aan u verleen.

Gedateer te ..... op hede die ..... dag van ..... 19 .....

Minister van Vervoer

## PERSOONSBESKRYWING VAN KANDIDAAT

| Lengte | Kleur van oë                                     | Kleur van hare | Geboortedatum | Geboorteplek |
|--------|--------------------------------------------------|----------------|---------------|--------------|
| Meter  |                                                  |                |               |              |
|        |                                                  |                |               |              |
| Ras    | Persoonlike merke of eienaardighede (as daar is) |                |               |              |
|        |                                                  |                |               |              |

Hierdie sertifikaat word uitgereik op grond van 'n eksamen waarin geslaag is te ..... op hede die ..... dag van ..... 19 .....

Handtekening van bevoegde beamppte of eksaminator

Kantoordatumstempel

Handtekening van houër

## STRAWWE VIR BEDRIEGLIKE HANDELINGE IN VERBAND MET HIERDIE SERTIFIKAAT

Enigeen wat—

(a) 'n bekwaamheidsertifikaat wat kragtens Wet 57 van 1951 uitgereik is, vervals; of

(b) 'n vervalste dokument wat heet 'n bekwaamheidsertifikaat te wees wat kragtens Wet 57 van 1951 uitgereik is, vertoon of andersins uitgee terwyl hy weet dat dit vervals is; of

(c) 'n bekwaamheidsertifikaat wat ingetrek of opgeskort is of wat verstryk het of waarop hy nie geregtig is nie, wetens vertoon of andersins gebruik; of

(d) 'n bekwaamheidsertifikaat aan 'n persoon leen van wie hy weet dat hy nie daarop geregtig is nie, of toelaat dat so 'n persoon dit gebruik;

begaan 'n misdryf en is by skuldigbevinding strafbaar met 'n boete van R2 000 of met gevangenisstraf van twee jaar of met beide sodanige boete en gevangenisstraf [sien artikels 313 (2) en 315 van Wet 57 van 1951].

*L.W.*—Enigeen, behalwe die eienaar hiervan, wat in besit kom van hierdie sertifikaat, moet dit dadelik aan die Sekretaris van Vervoer, Pretoria, stuur.

## ADDISIONELE KWALIFIKASIES

## REPUBLIEK VAN SUID-AFRIKA

## BEKWAAMHEIDCERTIFIKAAT AS HOOF INGENIEUROFFISIER—SPESIALE GRAAD

No. ....

Aan .....

Nademaal u aan al die vereistes wat by wet voorgeskryf is vir die verlening aan u van 'n bekwaamheidsertifikaat as Hoof-ingenieur-offisier—Spesiale Graad voldoen het, word hierdie sertifikaat kragtens artikel ..... van die Handelskeepvaartwet, 1951 (Wet 57 van 1951), soos gewysig, aan u verleen.

Gedateer te ..... op hede die ..... dag van ..... 19 .....

Minister van Vervoer

## PROPELLING MACHINERY

No. ....

To .....

Whereas you have satisfied all the requirements prescribed by law for the grant to you of a Certificate of Competency as .....

Engineer-Officer of a ..... fitted with .....

propelling machinery, this certificate is granted to you in terms of section ..... of the Merchant Shipping Act, 1951 (Act 57 of 1951), as amended.

Dated at ..... this ..... day of ..... 19 .....

Minister of Transport

## PERSONAL DESCRIPTION OF CANDIDATE

| Height | Colour of eyes                           | Colour of hair | Date of birth | Place of birth |
|--------|------------------------------------------|----------------|---------------|----------------|
| Metres |                                          |                |               |                |
|        |                                          |                |               |                |
| Race   | Personal marks or peculiarities (if any) |                |               |                |
|        |                                          |                |               |                |

This certificate is given upon an examination passed at ..... on the ..... day of ..... 19 .....

Signature of proper officer or examiner

Office Date Stamp

Signature of holder

## PENALTIES FOR FRAUDULENT ACTS CONNECTED WITH THIS CERTIFICATE

Any person who—

(a) forges any certificate of competency issued under Act 57 of 1951; or

(b) produces or otherwise puts off any forged document purporting to be a certificate of competency issued under Act 57 of 1951, which he knows to be forged; or

(c) knowingly produces or otherwise uses any certificate of competency which has been cancelled or suspended or which has expired or to which he is not entitled; or

(d) lends to any person who he knows is not entitled thereto a certificate of competency or allows it to be used by any such person;

is guilty of an offence and on conviction is liable to a fine of R2 000 or two years' imprisonment or both [see sections 313 (2) and 315 of Act 57 of 1951].

*N.B.*—Any person other than the owner hereof becoming possessed of this certificate should transmit it forthwith to the Secretary for Transport, Pretoria.

## ADDITIONAL QUALIFICATIONS

## REPUBLIC OF SOUTH AFRICA

## CERTIFICATE OF COMPETENCY AS CHIEF ENGINEER-OFFICER—SPECIAL GRADE

No. ....

To .....

Whereas you have satisfied all the requirements prescribed by law for the grant to you of a Certificate of Competency as Chief Engineer-Officer—Special Grade this certificate is granted to you in terms of section ..... of the Merchant Shipping Act, 1951 (Act 57 of 1951), as amended.

Dated at ..... this ..... day of ..... 19 .....

Minister of Transport

## PERSOONSBESKRYWING VAN KANDIDAAT

|        |                                                  |                |               |              |
|--------|--------------------------------------------------|----------------|---------------|--------------|
| Lengte | Kleur van oë                                     | Kleur van hare | Geboortedatum | Geboorteplek |
| Meter  |                                                  |                |               |              |
|        |                                                  |                |               |              |
| Ras    | Persoonlike merke of eienaardighede (as daar is) |                |               |              |
|        |                                                  |                |               |              |

Hierdie sertifikaat word uitgereik op grond van 'n eksamen waarin geslaag is te ..... op hede die ..... dag van ..... 19.....

Handtekening van bevoegde beampte  
of eksaminator

Kantoordatumstempel

Handtekening van houer

### STRAWWE VIR BEDRIEGLIKE HANDELINGE IN VERBAND MET HIERDIE SERTIFIKAAT

Enigteen wat—

(a) 'n bekwaamheidsertifikaat wat kragtens Wet 57 van 1951 uitgereik is, vervals; of

(b) 'n vervalste dokument wat heet 'n bekwaamheidsertifikaat te wees wat kragtens Wet 57 van 1951 uitgereik is, vertoon of andersins uitgee terwyl hy weet dat dit vervals is; of

(c) 'n bekwaamheidsertifikaat wat ingetrek of opgeskort is of wat verstryk het of waarop hy nie geregtig is nie, wetens vertoon of andersins gebruik; of

(d) 'n bekwaamheidsertifikaat aan 'n persoon leen van wie hy weet dat hy nie daarop geregtig is nie, of toelaat dat so 'n persoon dit gebruik;

begaan 'n misdryf en is by skuldigbevinding strafbaar met 'n boete van R2 000 of met gevangenisstraf van twee jaar of met beide sodanige boete en gevangenisstraf [sien artikels 313 (2) en 315 van Wet 57 van 1951].

*L.W.*—Enigteen, behalwe die eienaar hiervan, wat in besit kom van hierdie sertifikaat, moet dit dadelik aan die Sekretaris van Vervoer, Pretoria, stuur.

### ADDISIONELE KWALIFIKASIES

#### AANHANGSEL 6

#### REPUBLIEK VAN SUID-AFRIKA

#### DIENSSERTIFIKAAT AS

van ..... No. ....

Naam .....

wat aan die bepalings van artikel 80 van die Handelskeepvaartwet, 1951 (Wet 57 van 1951), soos gewysig, voldoen het, word hierdie dienssertifikaat toegeken.

Gedateer te ..... op hede die ..... dag van ..... 19.....

Sekretaris van Vervoer

## PERSONAL DESCRIPTION OF CANDIDATE

|        |                                          |                |               |                |
|--------|------------------------------------------|----------------|---------------|----------------|
| Height | Colour of eyes                           | Colour of hair | Date of birth | Place of birth |
| Metres |                                          |                |               |                |
|        |                                          |                |               |                |
| Race   | Personal marks or peculiarities (if any) |                |               |                |
|        |                                          |                |               |                |

This certificate is given upon an examination passed at ..... on the ..... day of ..... 19.....

Office Date Stamp

Signature of proper officer or examiner

Signature of Holder

### PENALTIES FOR FRAUDULENT ACTS CONNECTED WITH THIS CERTIFICATE

Any person who—

(a) forges any certificate of competency issued under Act 57/1951; or

(b) produces or otherwise puts off any forged document purporting to be a certificate of competency issued under Act 57 of 1951, which he knows to be forged; or

(c) knowingly produces or otherwise uses any certificate of competency which has been cancelled or suspended or which has expired or to which he is not entitled; or

(d) lends to any person who he knows is not entitled thereto a certificate of competency or allows it to be used by any such person;

is guilty of an offence and on conviction is liable to a fine of R2 000 or two years' imprisonment or both [see sections 313 (2) and 315 of Act 57 of 1951].

*N.B.*—Any person other than the owner hereof becoming possessed of this certificate should transmit it forthwith to the Secretary for Transport, Pretoria.

### ADDITIONAL QUALIFICATIONS

#### ANNEXURE 6

#### REPUBLIK OF SOUTH AFRICA

#### CERTIFICATE OF SERVICE AS

of ..... No. ....

Name .....

having complied with the provisions of section 80 of the Merchant Shipping Act, 1951 (Act 57 of 1951), as amended, is hereby granted this certificate of service

Dated at ..... this ..... day of ..... 19.....

Secretary for Transport



## PERSOONSBEKRYWING VAN KANDIDAAT

|        |                                                  |                |               |              |
|--------|--------------------------------------------------|----------------|---------------|--------------|
| Lengte | Kleur van oë                                     | Kleur van hare | Geboortedatum | Geboorteplek |
| Meter  |                                                  |                |               |              |
|        |                                                  |                |               |              |
| Ras    | Persoonlike merke of eienaardighede (as daar is) |                |               |              |
|        |                                                  |                |               |              |

Handtekening van houër

Uitgereik by die hawe.....  
op hede die.....dag van.....19.....

Handtekening van bevoegde beampte  
of eksaminator

Datumstempel

STRAWWE VIR BEDRIEGLIKE HANDELINGE IN  
VERBAND MET HIERDIE SERTIFIKAAT

Enigeen wat—

(a) 'n dienssertifikaat wat kragtens Wet 57 van 1951 uitgereik is, vervals; of

(b) 'n vervalste dokument wat heet 'n dienssertifikaat te wees wat kragtens Wet 57 van 1951 uitgereik is, vertoon of andersins uitgee terwyl hy weet dat dit vervals is; of

(c) 'n dienssertifikaat wat ingetrek of opgeskort is of wat verstryk het of waarop hy nie geregtig is nie, wetens vertoon of andersins gebruik; of

(d) 'n dienssertifikaat aan 'n persoon leen van wie hy weet dat hy nie daarop geregtig is nie, of toelaat dat so 'n persoon dit gebruik;

begaan 'n misdryf en is by skuldigbevinding strafbaar met 'n boete van R2 000 of met gevangenisstraf van twee jaar of met beide sodanige boete en gevangenisstraf [sien artikels 313 (2) en 315 van Wet 57 van 1951].

*L.W.*—Enigeen, behalwe die eienaar hiervan, wat in besit kom van hierdie sertifikaat, moet dit dadelik aan die Sekretaris van Vervoer, Pretoria, stuur.

## ADDISIONELE KWALIFIKASIES

## AANHANGSEL 7

## LYS VAN VRYSTELLINGSKWALIFIKASIES

| Eksamen vir 'n sertifikaat van bekwaamheid | Vrystellingskwalifikasies op 'n vak-vir-vak-grondslag                                |
|--------------------------------------------|--------------------------------------------------------------------------------------|
| Tweede Ingenieur-offisier (Kusvaart)       | (a) Die Nasionale Tegniese Sertifikaat                                               |
| of                                         | of                                                                                   |
| Hoof-ingenieur-offisier (Kusvaart)         | (b) Die Nasionale Intermediêre Tegniese Diploma asook vier T.3-vakke                 |
| of                                         | of                                                                                   |
| Tweede Ingenieur-offisier (Vreemde Vaart)  | (c) Die voltooiing van al die tweedejaarskursusse van 'n B.Sc-graad (Ingenieurswese) |
| Hoof-ingenieur-offisier (Vreemde Vaart)    | (a) Die Hoër Nasionale Tegniese Sertifikaat                                          |
|                                            | of                                                                                   |
|                                            | (b) Die Nasionale Tegniese Diploma                                                   |
|                                            | of                                                                                   |
|                                            | (c) Die voltooiing van al die derdejaarskursusse van 'n B.Sc-graad (Ingenieurswese)  |

## PERSONAL DESCRIPTION OF CANDIDATE

|        |                                          |                |               |                |
|--------|------------------------------------------|----------------|---------------|----------------|
| Height | Colour of eyes                           | Colour of hair | Date of birth | Place of birth |
| Metres |                                          |                |               |                |
|        |                                          |                |               |                |
| Race   | Personal marks or peculiarities (if any) |                |               |                |
|        |                                          |                |               |                |

Signature of holder

Issued at the port of.....  
this.....day of.....19.....

Signature of proper officer or examiner

Date Stamp

## PENALTIES FOR FRAUDULENT ACTS CONNECTED WITH THIS CERTIFICATE

Any person who—

(a) forges any certificate of service issued under Act 57 of 1951; or

(b) produces or otherwise puts off any forged document purporting to be a certificate of service issued under Act 57 of 1951, which he knows to be forged; or

(c) knowingly produces or otherwise uses any certificate of service which has been cancelled or suspended or which has expired or to which he is not entitled; or

(d) lends to any person who he knows is not entitled thereto a certificate of service or allows it to be used by any such person;

is guilty of an offence and on conviction is liable to a fine of R2 000 or two years' imprisonment or both [see sections 313 (2) and 315 of Act 57 of 1951].

*N.B.*—Any person other than the owner hereof becoming possessed of this certificate should transmit it forthwith to the Secretary for Transport, Pretoria.

## ADDITIONAL QUALIFICATIONS

## ANNEXURE 7

## LIST OF EXEMPTING QUALIFICATIONS

| Certificate of competency examination   | Exempting qualifications on a subject for subject basis                          |
|-----------------------------------------|----------------------------------------------------------------------------------|
| Second Engineer-officer (Coasting)      | (a) The National Certificate for Technicians, or                                 |
| or                                      | (b) The National Intermediate Diploma for Technicians plus four T.3 subjects, or |
| Chief Engineer-officer (Coasting)       |                                                                                  |
| or                                      |                                                                                  |
| Second Engineer-officer (Foreign-going) | (c) The completion of all courses of a second year B.Sc (Engineering) Course     |
| Chief Engineer-officer (Foreign-going)  | (a) The Higher National Certificate for Technicians, or                          |
|                                         | (b) The National Diploma for Technicians, or                                     |
|                                         | (c) The completion of all courses of a third year B.Sc (Engineering) Course      |

| <i>Eksamen vir 'n sertifikaat van bekwaamheid</i> | <i>Vrystellingskwalifikasies op 'n vak-vir-vak-grondslag</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <i>Certificate of competency examination</i> | <i>Exempting qualifications on a subject for subject basis</i>                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hoof-ingenieur-offisier (Vreemde Vaart)           | (a) Die Suid - Afrikaanse Hoër Nasionale Diploma<br>of<br>(b) Die voltooiing van 'n Universiteitsgraad in Ingenieurswese                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Chief Engineer-officer (Foreign-going)       | (a) The South African Higher National Diploma, or<br>(b) The completion of a university degree course in Engineering, or                                                                                                                                                                                                                                                                                                                                                         |
| Spesiale Graad.....                               | (c) Geïnkorporeerde lidmaatskap van 'n geëksploreerde Britse ingenieurswese - instituut op grond van 'n "Council of Engineering Institution"-eksamen<br>of<br>(d) Geïnkorporeerde lidmaatskap van die Londonse Instituut vir Meganiese Ingenieurs by wyse van eksamen voor die instelling van die Instituut vir Ingenieurswese.<br>of<br>(e) Registrasie as 'n professionele Ingenieur kragtens die Wet op Professionele Ingenieurs 1968 deurdat in 'n eksamen volgens die standaard van 'n graad geslaag is.<br>(f) Die Britse Buitengewone Eersteklas-bekwaamheidsertifikaat | Special Grade.....                           | (c) Corporate membership of a chartered British engineering institution by Council of Engineering Institution examination, or<br>(d) Corporate membership of the London Institution of Mechanical Engineers by examination prior to the formation of the C.E.I., or<br>(e) Registration as a professional engineer under the Professional Engineers Act of 1968 by reason of passing a degree level examination.<br>(f) The British Extra-First Class Certificate of Competency. |

**Opmerkings:**

- (i) In die geval van 'n Hoof-ingenieur-offisier (Spesiale Graad) is die lys van vrystellingskwalifikasies hierbo genoem, bykomende by die besit van 'n bekwaamheidsertifikaat as Hoof-ingenieur-offisier van stoomskepe en motorskepe op vreemde vaart.
- (ii) Vak-vir-vak-grondslag beteken vakke wat nou verwant is en hoef nie identies te wees nie.
- (iii) Die Suid-Afrikaanse Hoër Nasionale Diploma word tans ontwerp. Dit sal aan die student geleentheid bied om met sy studies te vorder tot 'n hoër vlak as die Nasionale Diploma.

**Notes:**

- (i) In the case of Chief Engineer-officer (Special Grade) the exempting qualifications listed above are additional to holding a certificate of competency as Chief Engineer-officer of foreign-going steamships and motorships.
- (ii) Subject for subject basis means subjects which are closely related and need not be identical subjects.
- (iii) The South African Higher National Diploma is at present being designed. It will give the student an opportunity to advance his studies beyond the National Diploma level.

**INHOUD**

| <i>No.</i>                                                               | <i>Bladsy No.</i> | <i>Staatskoerant No.</i> |
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