

**CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY –
MARINE ENGINEER OFFICER**

EXAMINATIONS ADMINISTERED BY THE
SCOTTISH QUALIFICATIONS AUTHORITY
ON BEHALF OF THE
MARITIME AND COASTGUARD AGENCY

STCW 95 SECOND ENGINEER REG. III/2 (UNLIMITED)

042-27 – ENGINEERING KNOWLEDGE - GENERAL

MONDAY Paper 67

0915- 1215 hrs

Examination paper inserts:

--

Notes for the guidance of candidates:

Candidates are required to obtain 50% of the total marks allocated to this paper to gain a pass **AND** also obtain a minimum 40% in Sections A, B and C of the paper.

Materials to be supplied by examination centres:

Candidate's examination workbook

ENGINEERING KNOWLEDGE - GENERAL

Attempt TEN questions only as follows:

SIX questions from Section A

TWO questions from Section B

TWO questions from Section C

Marks for each part question are shown in brackets

All questions carry equal marks

SECTION A

Attempt SIX questions only from this section

1. Describe, with the aid of a sketch, the operation of a system for remote indication of the level of water in an auxiliary boiler. (10)

2. With reference to positive displacement pumps suitable for bilge duties:
 - (a) sketch a progressive cavity (Mono) pump; (5)
 - (b) explain why the pump drive requires universal joints; (3)
 - (c) state the consequences of this type of pump being allowed to run dry. (2)

3. With reference to a keyless propeller designed for hydraulic fitting and removal:
 - (a) sketch a propeller nut suitable for use with a keyless propeller; (4)
 - (b) describe EACH of the following:
 - (i) how the nut is used to mount a propeller; (2)
 - (ii) how the nut is used to dismount a propeller; (2)
 - (c) explain how thrust is transmitted from the tailshaft to the propeller without the use of a key and keyway. (2)

4.
 - (a) Sketch a stern tube lubricating oil system. (5)
 - (b) Explain why some vessels require more than one stern tube header tank. (2)
 - (c) Describe the arrangement which prevents both oil loss and sea water ingress, at the tailshaft. (3)

5. With reference to a low heat source evaporator:
- (a) state the regulations pertaining to the evaporator if the distillate is to be used for human consumption; (4)
 - (b) describe how a leaking condenser tube would be indicated, identified and rectified. (6)
6. With reference to a large reciprocating refrigeration compressor fitted with a safety head:
- (a) sketch a cross section through one cylinder and cylinder cover; (6)
 - (b) explain the reasons for fitting the safety head; (2)
 - (c) explain the reasons an unloader is fitted. (2)
7. When on deep sea passage, as Second Engineer Officer, on entering the engine room you are met with the following scenario:
- a strong smell of sewage effluent; sewage treatment plant showing high level alarm; aft bilge well in high alarm; sewage discharge pump running but amperes reading low.
- State the actions to be taken and maintenance required to restore the plant to correct working order. (10)
8. (a) Describe, with the aid of a sketch, an engine room High Fog smothering system. (8)
- (b) State TWO advantages of the system sketched in Q8(a) over systems which employ an inert gas. (2)

SECTION B

Attempt TWO questions only from this section

9. With reference to automatic Power Management Systems (PMS) for the control of the operation of the main switchboards and generators:
- (a) list the features that the PMS controls in order to comply with the requirements for a modern vessel; (7)
 - (b) explain how the generators and switchboard would be controlled following a failure of the PMS. (3)
10. With reference to the electrical protection of a.c. induction motors:
- (a) state, with reasons, the type of fuses that are employed; (3)
 - (b) explain the effects of single phasing, stating how the protective devices should operate; (5)
 - (c) state why after an overcurrent trip the motor should not be repeatedly started and how doing so is prevented. (2)
11. (a) Sketch a circuit showing how the emergency generator is started, connected to the emergency busbars and how the main busbars are disconnected in the event of a blackout. (6)
- (b) Explain how an emergency generator can be tested to ensure that it is capable of satisfactorily delivering the rated power. (4)

SECTION C

Attempt TWO questions only from this section

12. With reference to double bottom fuel tanks:
- (a) state why weighted cocks are fitted to the tank sounding pipes; (2)
 - (b) state the purpose of air pipes; (2)
 - (c) state the design features incorporated on air pipe vents with respect to EACH of the following:
 - (i) heavy weather; (2)
 - (ii) fire; (2)
 - (iii) bunkering. (2)
13. (a) Sketch a midship section of a ship, labelling EACH of the following:
- (i) camber; (1)
 - (ii) bilge radius; (1)
 - (iii) bilge keel; (1)
 - (iv) flat of bottom; (1)
 - (v) rise of floor. (1)
- (b) State FIVE terms used to describe the conditions that relate to the distortion a hull undergoes, stating in EACH case, the stresses involved. (5)
14. (a) State why bulwarks are fitted to ships decks. (2)
- (b) Sketch EACH of the following types of bulwark:
- (i) open; (4)
 - (ii) floating. (4)