

**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 12 DECEMBER 2011

0915- 1215 hrs

Examination paper inserts:

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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. (a) Sketch a direct-reading water level gauge as fitted to the shell or drum of an auxiliary boiler. (6)
- (b) State the procedure to prove that the gauge is reading correctly. (4)

2. (a) Sketch a single cylinder, double acting reciprocating pump, labelling the component parts and showing how pressure fluctuations are dampened. (7)
- (b) State, with reasons, the duties that the pump sketched in Q2(a) is particularly suited. (3)

3. With reference to centrifugal separators, explain EACH of the following:
 - (a) the function and operation of the lower paring disc; (2)
 - (b) how the correct paring disc height is ascertained; (2)
 - (c) how the paring disc height may be adjusted; (2)
 - (d) the function of the buffer springs; (2)
 - (e) how the bowl spindle *run out* is measured. (2)

4. With reference to a keyless propeller designed for hydraulic (wet) fit and withdrawal:
 - (a) describe how the propeller is:
 - (i) fitted to the propeller shaft; (4)
 - (ii) withdrawn from the propeller shaft. (2)
 - (b) state TWO advantages compared to a dry fit; (2)
 - (c) explain how the thrust is transmitted without the use of a key and keyway. (2)

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5. With reference to a firemain system on a ship's weather deck:
- (a) sketch a firemain pipe expansion joint; (3)
 - (b) state the reasons for fitting an expansion joint; (2)
 - (c) describe the routine maintenance required on a firemain to ensure that it is ready for use in an emergency. (5)
6. (a) Describe, with the aid of a sketch, a domestic fresh water sterilisation process that uses silver ions. (6)
- (b) State the benefits of using silver ions. (2)
 - (c) State the dosing concentration and residual values of silver ions in the fresh water system. (2)
7. (a) Sketch a cross section through a room solenoid valve used in a provisions refrigerating plant. (5)
- (b) Describe the operation of the valve sketched in Q7(a) making reference to the cold room temperature. (3)
 - (c) Explain how solenoid valves affect the operation of a refrigeration compressor. (2)
8. Describe how outbreaks of fire can be extinguished in EACH of the following cases:
- (a) bales of cotton waste in a store room; (3)
 - (b) cargo fire in a hold; (3)
 - (c) engine room oil spill. (4)

SECTION B

Attempt TWO questions only from this section

9. With reference to braking of a.c. induction motors:
- (a) explain why braking may be required; (2)
 - (b) explain why electrical braking is preferable to mechanical braking; (2)
 - (c) explain the term *plugging*; (2)
 - (d) describe how dynamic braking is achieved. (4)
10. With reference to the protection of High Voltage electric a.c. motors:
- (a) state the type of fuse that is fitted and how it prevents single phasing; (3)
 - (b) describe the operation of EACH of the following direct temperature sensors:
 - (i) resistance temperature device; (3)
 - (ii) thermistor. (4)
11. (a) Sketch a shipboard connection that will enable a ship's electrical system to be supplied from shore. (5)
- (b) Describe the arrangement sketched in Q11(a), stating the checks and precautions to be taken before the ship's electrical system is energised from the shore supply. (5)

SECTION C

Attempt TWO questions only from this section

12. Sketch a transom stern from poop deck to stern frame detailing the stringers, stiffeners and brackets used in the construction. (10)
13. With reference to container ships:
- (a) sketch a transverse section through the midship area; (5)
 - (b) describe how adequate ship strength is built into the hull. (5)
14. (a) With reference to weatherdeck cargo hatch covers, state, with reasons, the type of vessel that would be equipped with EACH of the following:
- (i) lift off; (2)
 - (ii) rolling; (2)
 - (iii) folding. (2)
- (b) Sketch a low friction sliding bearing which will transmit the weight of a large, heavy hatch cover to the ship's hull. (4)