

**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, 26 MARCH 2012

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. List FIVE elements that may be added to steel to improve its physical properties, explaining the effects of EACH. (10))

2. Describe, with the aid of a sketch, a waterjet, transverse, thruster. (10)

3. Sketch EACH of the following fire detector heads, describing their operation:
 - (a) rate of temperature rise; (5)
 - (b) flame detector. (5)

4. Describe, with the aid of a sketch, a central priming system. (10)

5. State, with reasons, the suitability of EACH of the following courses of action in the event of an overheated main transmission bearing:
 - (a) reduction of shaft speed; (2)
 - (b) cooling with a fire hose; (2)
 - (c) changing the lubricating oil; (2)
 - (d) adjusting the height of the bearing; (2)
 - (e) adjusting the height of adjacent bearings. (2)

6. Describe, with the aid of a sketch, an instrument to measure temperature that uses the variation of resistance with the application of heat. (10)

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7. (a) State TWO reasons that will necessitate the opening up and entry of a large biological sewage system. (2)
- (b) Explain the precautions to be taken when entering a sewage treatment plant. (6)
- (c) State TWO hazards that personnel may be exposed to if entering a sewage unit. (2)
8. With reference to the gland sealing of pumps:
- (a) state the advantages and disadvantages of mechanical seals verses soft packing; (5)
- (b) sketch a cross section of a mechanical seal. (5)

SECTION B

Attempt TWO questions only from this section

9. With reference to the rotor of an induction motor:
- (a) state TWO reasons why the conductors are angled; (2)
 - (b) state the consequences of the air gap between the rotor and the stator being:
 - (i) too large; (2)
 - (ii) too small; (2)
 - (c) explain how rotor leakage flux takes place and its effect on motor operation. (4)
10. (a) Describe EACH of the following:
- (i) an insulated distribution system; (4)
 - (ii) an earthed distributed system. (4)
- (b) Explain a method of earthing high voltage installations. (2)
11. (a) Sketch a single cell of a nickel cadmium battery of the sealed type. (2)
- (b) State the chemical reactions that occur in the battery described in Q11(a). (2)
- (c) Explain how a nickel cadmium battery is able to operate sealed, under normal charged conditions. (4)
- (d) Sketch a battery charging system operated from the a.c. mains. (2)

SECTION C

Attempt TWO questions only from this section

12. Describe the examination of a rudder whilst the ship is in drydock. (10)
13. With reference to the engineroom gantry crane:
- (a) describe, with the aid of a sketch, an engineroom gantry crane depicting how it is secured to the ship's structure; (5)
 - (b) state how damage to the forward and aft bulkheads of the engineroom casing is prevented; (2)
 - (c) describe the checks that should be carried out prior to using an engineroom gantry crane. (3)
14. (a) Describe, with the aid of a sketch, the braking arrangements fitted for the controlled lowering of lifeboats. (7)
- (b) Describe how the braking arrangements fitted to lifeboats are tested. (3)