

**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, 28 MARCH 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. With reference to steering gear:
 - (a) describe, with the aid of a sketch, a hunting gear arrangement; (4)
 - (b) list the checks to be carried out 12 hours before departure. (6)

2. Describe, with the aid of a sketch, the operation of an hydraulic servo mechanism incorporated in the boss of a controllable pitch propeller. (10)

3. With reference to a pneumatic valve positioner incorporating a volume booster:
 - (a) explain, with the aid of a sketch, the operation of a positioner; (8)
 - (b) outline the immediate action to be taken to restore automatic control upon failure of the positioner bellows. (2)

4. (a) Sketch a stress/strain curve for a mild steel specimen. (2)
 - (b) With reference to a stress/strain curve, explain EACH of the following:
 - (i) modulus of elasticity; (2)
 - (ii) percentage elongation; (2)
 - (iii) Ultimate Tensile Stress; (2)
 - (iv) Yield Stress. (2)

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5. With reference to a machinery space multi-bottle, carbon dioxide, fire extinguishing installation:
- (a) sketch a line diagram of the installation, labelling the component parts; (6)
 - (b) state, with reasons, FOUR important actions to be taken before releasing carbon dioxide into the machinery spaces. (4)
6. (a) Describe, with the aid of a sketch, an oil content monitor suitable for limiting the oil discharge to 15 p.p.m. (5)
- (b) State THREE operations that are legally required to be recorded in the oil record book. (3)
 - (c) List the entries that will be made in the oil record book for ONE of the operations stated in Q6(b). (2)
7. (a) Sketch a low pressure controller designed to cut-out and restart the operation of a refrigeration compressor. (6)
- (b) Explain the operation of the controller sketched in Q7(a). (4)
8. Describe, with the aid of a sketch, a water jet, transverse thruster. (10)

SECTION B

Attempt TWO questions only from this section

9. (a) Describe, with the aid of a sketch, a high rupturing capacity fuse. (4)
- (b) Explain the term *discrimination* when applied to electrical protective devices. (4)
- (c) State how over current devices are tested. (2)
10. With reference to electric motors:
- (a) state FOUR reasons for overheating; (4)
- (b) describe, with the aid of a sketch, a device to limit overload. (6)
11. (a) Sketch a labelled block diagram of essential services provided from an emergency generator. (7)
- (b) Describe the testing procedure for an emergency generator. (3)

SECTION C

Attempt TWO questions only from this section

12. With reference to hydraulically operated watertight doors in the *doors closed mode*:
- (a) state the hazards associated with passing through doors; (3)
 - (b) describe a safe procedure for passing through doors. (7)
13. With reference to a water ballast tank:
- (a) explain how corrosion may occur, stating how it may be minimised; (6)
 - (b) explain how the atmosphere in the tank may become hazardous due to the corrosion process, the tests carried out prior to entry and the potential consequences of entering the hazardous atmosphere. (4)
14. (a) Describe, with the aid of a sketch, a bulwark that incorporates freeing ports, explaining why this arrangement is fitted. (5)
- (b) Describe, with the aid of a sketch, a double bottom, oil fuel tank ventilator, with an automatic valve. (5)