

**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 18 JULY 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. Describe EACH of the following properties of materials, stating the standard test for EACH:
 - (a) strength; (2)
 - (b) hardness; (2)
 - (c) ductility; (2)
 - (d) toughness; (2)
 - (e) brittleness. (2)

2.
 - (a) Sketch a pump used in a ship's engine room for salt water circulation. (5)
 - (b) Describe how the construction of the pump sketched in Q2(a) makes it suitable for the stated duty. (5)

3.
 - (a) Sketch an engine room bilge system, including the oily water separator and detailing the non return valves in the system. (6)
 - (b) State the regulations for pumping engine room bilges overboard. (4)

4.
 - (a) State the regulations pertaining to the main and auxiliary steering gear with reference to EACH of the following:
 - (i) rudder angle and time of operation; (2)
 - (ii) electrical supply. (3)
 - (b) Explain the procedures to be carried out to enable the steering capability to be maintained following the loss of bridge steering control. (5)

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5. (a) Sketch a bourdon tube compound pressure gauge. (5)
- (b) Explain how the gauge sketched in Q5(a) would be calibrated, stating the reference pressure the gauge would be zeroed at. (5)
6. (a) Sketch an auto clean type lubricating oil filter capable of filtration to 25 microns. (5)
- (b) Describe the operation of the filter sketched in Q6(a), stating how its cleanliness is maintained in service. (5)
7. With reference to a reciprocating refrigeration compressor:
- (a) sketch the mechanical shaft seal showing the component parts and how it is lubricated; (4)
- (b) describe the seal sketched in Q7(a), stating the materials used; (3)
- (c) state the effects of contaminated oil on the seal. (3)
8. (a) Describe, with the aid of a sketch, how automatic bunker fuel oil transfers take place, detailing all the safety devices incorporated in the system. (6)
- (b) Explain how the safeguards described in Q8(a) are tested. (4)

SECTION B

Attempt TWO questions only from this section

9. (a) State the FOUR criterion that must be fulfilled, in order to parallel a generator with the busbars and ensure that there is minimal circulating current between the incoming machine and the busbars. (4)
- (b) Describe how EACH of the criteria stated in Q11(a) is achieved. (4)
- (c) Explain the effects of closing the incoming generator circuit breaker when it is not in synchronism with the busbars. (2)
10. (a) Sketch a labelled block circuit diagram showing how the essential services are supplied from the generator and the interconnections to the main switchboard. (7)
- (b) State the regulations pertaining to the emergency generator starting and running requirements. (3)
11. With reference to main circuit breakers:
- (a) sketch a vacuum interruptor; (4)
- (b) explain the purpose of the vacuum interruptor sketched in Q11(a); (2)
- (c) state the function of EACH of the following:
- (i) arc chutes; (2)
- (ii) auxiliary contacts. (2)

SECTION C

Attempt TWO questions only from this section

12. State, with reasons, the main purposes of EACH of the following:
- (a) bulbous bow; (3)
 - (b) flare; (1)
 - (c) bilge keels; (3)
 - (d) sheer; (1)
 - (e) camber. (2)
13. (a) Sketch the constructional details of a balanced rudder. (6)
- (b) State the inspections that would be made on the rudder sketched in Q13(a) whilst in dry dock. (4)
14. (a) Sketch a sea chest suitable for the connection of a main sea water inlet valve, labelling all of the fittings. (5)
- (b) Explain why a bilge injection valve is incorporated into the main sea water system, describing how it is tested. (4)
- (c) Compare the valve diameters of the bilge and main injection valves. (1)