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, 16 JULY 2012

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. Sketch EACH of the following electric arc welding defects, stating the cause of EACH defect:

   (a) undercutting; (2)

   (b) porosity; (2)

   (c) lack of penetration; (2)

   (d) lack of fusion; (2)

   (e) slag inclusion. (2)

2. (a) Explain the meaning of EACH of the following terms:

      (i) two step control; (2)

      (ii) proportional control action; (2)

      (iii) integral control action. (2)

   (b) State, with reasons, a typical shipboard application for EACH of the following:

      (i) two step control action; (2)

      (ii) proportional plus integral action. (2)

3. (a) Describe, with the aid of a sketch, the constructional difference and operation of a Screw Down Non-Return valve and a Screw Lift valve of similar size. (5)

   (b) State THREE properties of the gland packing material used in a Globe Valve for sea water duties. (3)

   (c) Explain why non- return valves are used in engine room bilge systems. (2)

4. (a) Describe a method of checking main transmission shaft alignment which does not involve the removal of coupling bolts. (5)

(b) State why the shaft alignment should be checked when the ship is afloat in a light condition. (1)

(c) A shaft system is excessively misaligned so as to cause serious bending of the shaft. State what effect this could have on EACH of the following:

(i) the shaft coupling bolts; (1)

(ii) the shaft bearings. (1)

(d) State, with reasons, which of the effects stated in Q4(c) would cause most concern. (2)

5. Describe, with the aid of a sketch, a twin rotor screw type pump suitable for fuel oil duties detailing any protective devices that would be fitted to a pump of this type. (10)

6. With reference to a four ram steering gear:

(a) sketch a cross section through a ram crosshead showing the trunion and tiller arm bearings and how clearances are accommodated; (6)

(b) state a typical value for EACH of the following;

(i) weardown clearance; (1)

(ii) jumping clearance; (1)

(c) explain the consequences of EACH of the clearances stated in Q6(b) being reduced. (2)

7. With reference to Fig Q7, explain the purpose of the device and describe how it is set to operate. (10)

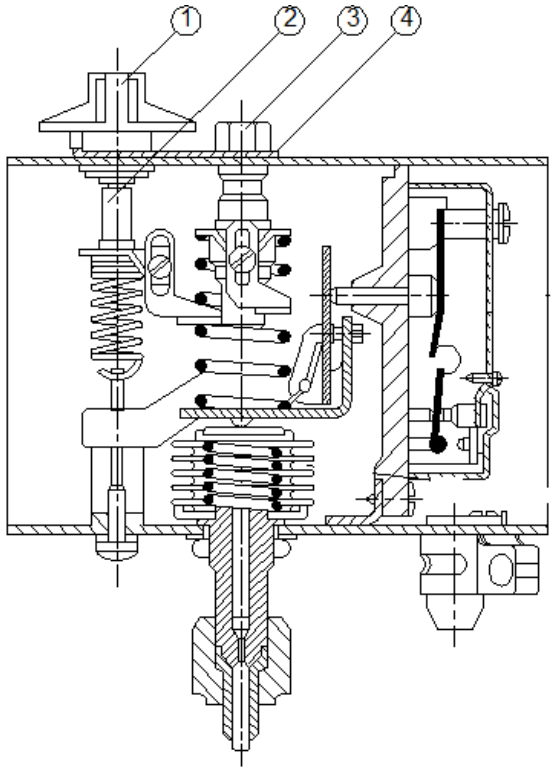

Fig Q7

8. (a) Describe, with the aid of a block diagram, an engine room High Fog smothering system. (9)

(b) State the major advantage of the system sketched in Q8(a) over systems which employ an inert gas. (1)

SECTION B

Attempt TWO questions only from this section

9. With reference to lighting circuits:

   (a) state the effects of using lamps rated at 240 volts in a 220 volt system; (2)

   (b) (i) explain the stroboscopic effect of discharge lamps and the hazards associated with this effect; (3)

   (ii) describe how stroboscopic effects may be alleviated. (5)

10. (a) Describe, with the aid of a sketch, the constructional details of a squirrel cage rotor as fitted in an induction motor. (8)

   (b) Explain why some rotors have a double cage. (2)

11. (a) Describe, with the aid of a sketch, the operation of a single phase motor that employs a starting circuit with a leading current. (6)

   (b) Explain how the start, run and common terminals on the motor described in Q11(a) could be identified if there were no markings on the terminals. (4)

SECTION C

Attempt TWO questions only from this section

12. With reference to structural fire protection in passenger ship accommodation spaces:

    (a) define the meaning of EACH of the following:

        (i) Class A bulkheads; (3)

        (ii) Class B bulkheads; (3)

    (b) where Class A bulkheads have to be penetrated, explain how the integrity of the bulkhead is retained with respect to EACH of the following:

        (i) doors; (2)

        (ii) ventilation trunking. (2)

13. Describe, with the aid of a sketch, EACH of the following types of rudder:

    (a) unbalanced; (3)

    (b) semi-balanced; (3)

    (c) balanced. (4)

14. With reference to ship's lifeboats:

    (a) sketch a main brake; (5)

    (b) state safety features incorporated in the brake should the operator:

        (i) let go of the brake handle completely during lowering; (1)

        (ii) attempt to lower the lifeboat too quickly; (1)

    (c) state the maximum rate of descent when launching; (1)

    (d) explain how the lifeboat is protected from falling back into the water if the power fails when hoisting the boat. (2)