

**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)

042-28 – ENGINEERING KNOWLEDGE - MOTOR

TUESDAY, 19 OCTOBER 2010

0915- 1215 hrs

Examination paper inserts:

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Notes for the guidance of candidates:

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Materials to be supplied by examination centres:

Candidate's examination workbook

ENGINEERING KNOWLEDGE – MOTOR

Attempt SIX questions only

All questions carry equal marks

Marks for each part question are shown in brackets

1.
 - (a) Sketch a section through a medium speed engine cylinder cover, showing how the cylinder cover is attached to the cylinder block. (8)
 - (b) Describe the procedure for disconnecting and removing from the engine the cylinder cover sketched in Q1(a). (8)

2. With reference to cylinder lubrication:
 - (a) describe, with the aid of a sketch, a crosshead engine cylinder lubrication system which controls the quantity and timing of cylinder oil injection; (8)
 - (b) describe how the cylinders of a trunk piston engine are lubricated and the lubrication quantity is controlled if a system using quills is not fitted. (8)

3.
 - (a) Describe the procedure for checking and setting fuel injectors to be fitted in one unit of a main engine. (6)
 - (b) Explain why the lifting pressure and spray pattern of fuel injectors fitted in the same unit should be identical. (4)
 - (c) Describe how fuel injector nozzles are cooled. (6)

4. With reference to the burning of LSHFO in main engines:
 - (a) sketch a main engine fuel system from the HFO and LSHFO service tanks to the main engine(s) showing all main features and valves; (8)
 - (b) describe the procedure for changing the main engine fuel system from HFO operation to LSHFO operation indicating the approximate timing of main events in the procedure. (8)

5. With reference to medium speed trunk piston engine exhaust valves:
- (a) explain why valve rotation devices are often fitted to exhaust valves; (5)
 - (b) describe, with the aid of a sketch, an exhaust valve rotation device; (5)
 - (c) explain why multiple exhaust valves are fitted. (6)
6. (a) Explain the possible causes if a main engine turbocharger suddenly starts to vibrate accompanied by activation of the engine central cooling system header tank low level alarm and large quantities of water in the turbocharger air cooler drain. (6)
- (b) Explain the immediate action to be taken in the event of the situation outlined in Q6(a) occurring. (4)
- (c) Describe the action to be taken to allow the main engine to be operated at reasonably normal power in the event of failure of a turbocharger fitted to the main engine which only has one turbocharger. (6)
7. (a) Explain how an emergency generator is maintained in a condition ready for immediate starting. (6)
- (b) Describe the considerations which must be taken in the event of the emergency generator being unavailable for use. (10)
8. (a) Sketch a generator starting air system employing an air motor. (6)
- (b) Describe how the starting air system sketched in Q8(a) operates. (6)
- (c) Describe the actuation and operation of a backup starting system for an emergency generator employing EITHER a spring starter OR an hydraulic starter. (4)
9. (a) Explain why boiler water treatment is necessary even though distilled water is used as feed water. (4)
- (b) Describe the procedure for obtaining a representative boiler water sample. (6)
- (c) List tests normally carried out on boiler water, stating what information the results of the tests provide about the condition of the boiler water. (6)