

**CERTIFICATES OF COMPETENCY IN THE MERCHANT NAVY -  
MARINE ENGINEER OFFICER**

EXAMINATIONS ADMINISTERED BY THE  
**SCOTTISH QUALIFICATIONS AUTHORITY**  
ON BEHALF OF  
**MARITIME AND COASTGUARD AGENCY**

**SECOND ENGINEER (UNLIMITED)**

**042-28 - ENGINEERING KNOWLEDGE - MOTOR**

**TUESDAY, 11 December 2012**

**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
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## ENGINEERING KNOWLEDGE - MOTOR

Attempt SIX questions only

Marks for each part question are shown in brackets

### Section A

1. With reference to main engine fuel injectors:
  - (a) describe how fuel injectors are replaced on an engine having multiple fuel injectors in each cylinder; (6)
  - (b) describe the procedure for overhauling a fuel injector; (5)
  - (c) describe the testing procedure for multiple fuel injectors which are to be fitted in the same cylinder. (5)
  
2.
  - (a) Sketch the lubrication systems for a crosshead engine, showing all essential valves and the fluid flow directions. (10)
  - (b) Describe how engine lubricating oil is maintained in a clean and effective condition. (6)
  
3.
  - (a) Sketch a reversing main engine starting air system, labelling the MAIN parts and indicating on the sketch the safety devices fitted. (8)
  - (b) Describe how the starting air system sketched in part (a) operates in order to start an engine, explaining how reversing of the engine is achieved. (8)
  
4.
  - (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 the tests normally carried out on boiler water, stating what information the results of the tests provide about the condition of the boiler water. (6)
  
5.
  - (a) Describe the procedure for preparing a main engine piston assembly for survey, assuming the piston is already removed from the engine. (6)
  - (b) List the type of faults which may be found during a piston assembly inspection, stating their location. (4)
  - (c) Describe the procedure for checking the piston crown profile and the piston ring grooves. (6)

6. (a) Explain how a diesel generator is prepared and selected as a standby generator. (8)
- (b) Write a procedure for checking a diesel generator engine after it has been shut down following a period of operation and before it is returned to standby duty. (8)
7. With reference to trunk piston, medium speed engines:
- (a) explain why multiple air inlet and exhaust valves are often fitted; (4)
- (b) explain why exhaust valve rotation is employed; (4)
- (c) explain how effective cylinder lubrication is obtained; (4)
- (d) describe how piston cooling is achieved. (4)
8. (a) Describe, with the aid of a sketch, the procedure for opening up a main bearing and preparing it for inspection. (8)
- (b) Describe the inspection of the main bearing, stating the checks that should be carried out during and following reassembly. (8)
9. (a) Explain how control of the main engine is changed from bridge control to local (engine side) control. (4)
- (b) List the controls and instruments situated at the local (engine side) control stand, stating the purpose of EACH control device or instrument. (6)
- (c) Describe how the main engine is operated from the local (engine side) control stand, stating the dangers of operating in this mode. (6)