

**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, 16 October 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

ENGINEERING KNOWLEDGE - MOTOR

Attempt SIX questions only

Marks for each part question are shown in brackets

Section A

1. (a) Describe, with the aid of a sketch, the procedure for changing a crosshead main engine exhaust valve. (8)
- (b) Describe the connections and checks which must be made after a crosshead main engine exhaust valve has been changed in order to ensure that it will operate correctly. (8)
2. (a) Explain the possible consequences of running an engine with cylinder powers excessively out-of-balance. (4)
- (b) Explain why perfect power balance between cylinders is not possible. (4)
- (c) Describe how cylinder power and performance can be assessed for a medium speed engine. (4)
- (d) Describe the adjustments which must be made to restore reasonable cylinder power balance to a medium speed engine. (4)
3. (a) State, with reasons, the precautions which must be observed when taking crankshaft deflections to ensure safety of personnel and accuracy of results. (5)
- (b) Describe the procedure for taking crankshaft deflections on a large crosshead diesel engine. (5)
- (c) Explain why crankshaft deflection readings are taken, indicating the possible consequences of excessive crankshaft deflection readings. (6)
4. (a) Sketch a section through a main engine fuel injector, labelling the main parts. (6)
- (b) State, with reasons, the factors which influence fuel atomisation in a fuel injector. (5)
- (c) State how atomisation of fuel deteriorates after prolonged injector operation. (5)
5. (a) Describe, with the aid of a sketch, an engine fuel injection system which may be controlled electronically. (6)
- (b) Explain how the fuel injection system described in part (a) operates. (5)
- (c) Explain how the fuel injection timing of the system described in part (a) may be varied by the operator, stating why it might be necessary to change the fuel injection timing. (5)

6. (a) Sketch in section an engine charge air system from the turbocharger to the engine scavenge ports, indicating all fluid flows, showing main instrumentation and naming the main parts. (10)
- (b) Explain why it is necessary to cool the charge air after a turbocharger. (4)
- (c) Explain why it is necessary to remove water from the charge air. (2)
7. With reference to scavenge fires:
- (a) explain the causes of a scavenge fire, stating how such an outbreak is brought to the notice of the duty engineer; (4)
- (b) describe the action which should be taken in order to extinguish a scavenge fire; (6)
- (c) state, with reasons, the checks which must be made after a scavenge fire has been extinguished in order to assess possible engine damage and minimise the risk of future scavenge fires. (6)
8. (a) Sketch a starting air system which would be used for starting a generator engine, explaining how the system operates. (8)
- (b) Explain how a generator engine is set so that it may be started automatically by the Power Management System, stating the precautions which must be observed at an engine selected for automatic standby. (8)
9. (a) Describe the procedure for checking the condition of a main engine cylinder liner. (8)
- (b) Explain how engine operations can change cylinder liner condition. (8)