

**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 July 2013

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

1. (a) Describe, with the aid of a sketch, the procedure for checking the guide clearances on a crosshead main engine. (10)
- (b) Explain how the guide clearances are adjusted. (6)

2. With reference to Vee-type medium speed engines:
 - (a) sketch an arrangement for attaching two connecting rods to the same crank pin; (5)
 - (b) describe, with the aid of a sketch, how a cylinder cover is removed from the engine; (6)
 - (c) describe how a piston is removed from the engine. (5)

3. (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)

4. (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)

5. (a) State the possible causes of turbocharger bearing failure and how this may be minimised. (8)
- (b) Describe, with the aid of a sketch, the procedure for removing turbocharger bearings for inspection. (6)
- (c) State the clearances to be checked when overhauling a turbocharger bearing system, explaining why these clearances are required. (2)

6. (a) Explain why main engine starting air compressors are of the multi-stage type. (4)
- (b) Explain why intercooling of air is employed between compressor stages. (4)
- (c) Explain why automatic drain traps are fitted to air compressor coolers. (4)
- (d) Explain why it is necessary to remove oil and water from the air leaving the starting air compressor. (4)
7. (a) Describe, with the aid of a sketch, a boiler burner fuel system, explaining how the main flame is ignited. (8)
- (b) Explain how the air and fuel supply to the burner are regulated together in the system described in part (a). (4)
- (c) Explain how the boiler burner system described in part (a) may be regulated manually, in the event of the remote control system failing. (4)
8. (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)
9. With reference to main engine starting air systems:
- (a) state the regulatory requirements for air receivers; (2)
- (b) describe TWO possible causes of an air start line explosion; (6)
- (c) describe safety devices fitted to reduce an explosion occurring; (6)
- (d) describe watchkeeping procedures to minimise the risk of an explosion. (2)