

**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, 18 October 2011

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:

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| Candidate's examination workbook |
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ENGINEERING KNOWLEDGE – MOTOR

Attempt SIX questions only

All questions carry equal marks

Marks for each part question are shown in brackets

1. (a) State, with reasons, SIX items which should be included in a risk assessment for lifting a main engine cylinder cover. (6)
- (b) Write a procedure for the removal of a vee-type engine cylinder cover and landing it on the engine room plates. (10)

2. (a) Sketch a complete lubrication system for a crosshead engine, showing how the oil is supplied to all parts of the engine. (8)
- (b) Explain how contamination of engine lubricating oil may occur and how it may be prevented. (8)

3. With reference to crankcase explosions:
 - (a) describe how a primary explosion occurs and how this may lead to a secondary explosion; (8)
 - (b) explain the action to be taken in the event of an oil mist detector alarm sounding. (8)

4. (a) Sketch a main engine charge air system, including the turbocharger, showing flow paths for the exhaust gas and combustion air. (6)
- (b) State which instruments may be used to assess the performance of a charge air system, indicating the location of such instruments on the sketch in Q4(a). (4)
- (c) Explain how the data provided by the instruments stated in Q4(b) is used to assess the performance of a charge air system. (6)

5. (a) Sketch a common rail fuel system which may be used for a main engine. (6)
- (b) Describe how the common rail fuel system sketched in Q5(a) operates to vary the timing and fuel quantity flow for cylinder fuel injectors. (10)

6. (a) Explain the FIVE factors which influence the effective combustion in a diesel engine cylinder. (10)
- (b) Explain how diesel engine cylinder combustion may deteriorate during engine service. (6)
7. (a) Explain why pressure charging is used for two-stroke main engines. (4)
- (b) Explain why charge air cooling is employed for pressure charged diesel engines. (4)
- (c) Explain why a water separator is generally fitted after a charge air cooler. (4)
- (d) Sketch a water separator which may be used for a turbocharged main engine system, explaining how it operates. (4)
8. (a) Sketch a main propulsion engine starting air system showing the location of all control and safety features. (6)
- (b) Describe how the system sketched in Q8(a) operates when a control signal to start the engine is initiated. (6)
- (c) If the engine fitted with the starting system sketched in Q8(a) fails to turn over on air when a start is initiated, making reference to the sketch, explain how the cause may be determined. (4)
9. (a) Describe how the gas surfaces of a waste heat boiler/economiser is cleaned during operation of the associated main engine. (5)
- (b) Explain the consequences of not maintaining the surfaces of a waste heat boiler/economiser in a clean condition. (5)
- (c) Explain what action may be taken to enable a main engine to remain in operation should an associated waste heat economiser suffer a tube failure necessitating it having to be taken out of service. (6)