

**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 JULY 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:

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. With reference to main engine thrust blocks:
  - (a) describe the principle of operation; (8)
  - (b) state an approximate figure for clearance, outlining the possible effects of incorrect clearance; (4)
  - (c) state how thrust clearance is measured. (4)
  
2.
  - (a) Describe, with the aid of a sketch, a resilient mounting unit that can be used to support a skid mounted integrated diesel engine/alternator unit. (10)
  - (b) Explain TWO modes of deterioration in service of the unit sketched in Q2(a). (4)
  - (c) State TWO causes of excessive vibration on the type of installation sketched in Q2(a). (2)
  
3. With reference to large slow speed 2-stroke engines:
  - (a) sketch an oil cooled piston and rod assembly, labelling the main components, indicating coolant flow and normal running piston crown temperatures; (8)
  - (b) state, with reasons, the materials used for the piston crown, skirt and rod; (4)
  - (c) describe the inspection and testing of the assembly sketched in Q3(a). (4)
  
4.
  - (a) Describe, with the aid of sketches, the procedure for taking main engine crankshaft deflections. (10)
  - (b) Explain the purpose of crankshaft deflections, stating how the data obtained is used. (6)

5. With reference to turbo charging:
- (a) explain the form and purpose of EACH of the following:
    - (i) diffuser; (2)
    - (ii) volute; (2)
    - (iii) labyrinth glands; (2)
    - (iv) aftercooler; (2)
    - (v) waste-gate. (2)
  - (b) state, with reasons, suitable in-service methods of cleaning EACH of the following:
    - (i) the impeller; (3)
    - (ii) the gas wheel. (3)
6. (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 the procedure for replacing fuel injectors for one unit of a main engine. (6)
7. (a) Sketch a main engine fuel oil system, from the service tank to the fuel injector, labelling all essential valves and devices. (10)
- (b) Describe the procedure for changing engine operation from HFO to MDO while the engine is still running, explaining the precautions which must be taken. (6)
8. With reference to the production of high pressure air for engine starting purposes:
- (a) explain why multi-stage air compressors are used to produce the pressures required; (4)
  - (b) explain why large air compressors should be started and stopped in the unloaded condition; (4)
  - (c) explain why compressor air filters should be maintained in a clean condition; (4)
  - (d) explain why lubricating oil consumption should be closely monitored and recorded. (4)

9. (a) Describe, with the aid of a sketch, a steam raising plant suitable for fuel heating and hotel duties, utilising oil fired boiler and exhaust gas economiser, indicating the pressures and temperatures at relevant parts of the system. (10)
- (b) State the means of cleaning the gas and water sides of the economiser during normal operation. (6)