

**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, 14 DECEMBER 2010

0915- 1215 hrs

Examination paper inserts:

--

Notes for the guidance of candidates:

--

Materials to be supplied by examination centres:

Candidate's examination workbook

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 the inspection and overhaul of a main engine bottom end bearing:
 - (a) explain the checks prior to commencing the overhaul; (4)
 - (b) describe the process of dismantling for inspection; (6)
 - (c) list TWO defects which may be found on the bearing or pin during inspection, explaining their possible causes; (2)
 - (d) state, with reasons, the checks which must be made prior to putting an engine back into full power service following the overhaul of a bottom end bearing. (4)

2.
 - (a) Sketch a section of a medium speed, 4-stroke engine cylinder head, through an inlet valve, exhaust valve and injector pocket. (7)
 - (b) Explain why multiple air inlet and exhaust valves are fitted. (6)
 - (c) Explain why double valve springs are fitted. (3)

3.
 - (a) Sketch a section through one unit of a medium speed engine (to include the connecting rod and crankpin oil galleries) to show the oil flow and cooling action. (8)
 - (b) Sketch an oil control ring profile, explaining its action. (4)
 - (c) Explain TWO possible causes of excessive lubricating oil consumption following a unit overhaul of a medium speed engine. (4)

4. With reference to a piston rod stuffing box:
- (a) explain, with the aid of a sketch, the operation of the stuffing box; (8)
 - (b) explain, with the aid of sketches, EACH of the following:
 - (i) a method of checking the tension and suitability of garter springs for further service; (2)
 - (ii) how individual rings with butt clearances form a full circumferential seal on the piston rod; (3)
 - (iii) bedding in of a new ring segment to mate with used piston rod, indicating where end relief would be applied. (3)
5. With reference to turbocharged four stroke engines:
- (a) describe, with the aid of a sectioned sketch, the function of a radial (exhaust inlet) flow turbocharger, indicating the flow path of the lubricating oil and exhaust gas; (12)
 - (b) explain the purpose and function of a *waste-gate*. (4)
6. (a) Describe, with the aid of a sketch, EACH of the following:
- (i) the operating principle of an hydraulic droop governor; (6)
 - (ii) the difference between idling speed and droop. (2)
- (b) State, with reasons, the desirable properties of the operating fluid for an hydraulic governor. (4)
- (c) With reference to electronic speed governing systems, explain the operating principle of a *reluctor* type speed sensor. (4)
7. (a) Describe supporting, holding down and locating arrangements for a main diesel engine in the way of a transverse girder. (14)
- (b) Explain the cause and effect of finding the holding down arrangement in Q7(a) repeatedly in need of re-tensioning. (2)
8. (a) State the considerations regarding main air receiver capacity. (8)
- (b) Explain the desirable properties of an internal surface coating for an air receiver. (4)
- (c) Explain the need for regular operation of air receiver drain valves. (4)

9. With reference to scavenge fires:

- (a) explain how a scavenge fire is caused, indicating how it is brought to the attention of the duty engineer; (5)
- (b) describe the action which must be taken to ensure a scavenge fire is extinguished; (6)
- (c) explain how scavenge fires may be prevented. (5)