

CERTIFICATES OF COMPETENCY FOR ENGINEERS (YACHT)

**EXAMINATIONS ADMINISTERED BY THE
SCOTTISH QUALIFICATIONS AUTHORITY
ON BEHALF OF
MARITIME AND COASTGUARD AGENCY**

SMALL VESSEL SECOND ENGINEER

060-01 - MARINE DIESEL ENGINEERING

FRIDAY, 29 April 2022

1400-1600 hrs

Examination paper inserts:

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Notes for the guidance of candidates:

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| <ol style="list-style-type: none">1. Candidates should note that 100 marks are allocated to this paper. To pass candidates must achieve 50 marks.2. Non-programmable calculators may be used3. All formulae used must be stated and the method of working and ALL intermediate steps must be made clear in the answer. |
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Materials to be supplied by examination centres:

Candidate's examination workbook

MARINE DIESEL ENGINEERING

Attempt ALL questions

Marks for each part question are shown in brackets

1. (a) With reference to the combustion of fuel, explain EACH of the following terms:
 - (i) atomisation; (3)
 - (ii) penetration; (2)
 - (iii) compression ratio. (1)
- (b) State the factors which influence the terms explained in part (a). (4)

2. With reference to diesel engine turbocharger construction, explain the purpose of EACH of the following:
 - (a) labyrinth glands; (3)
 - (b) diffuser; (3)
 - (c) inducer; (2)
 - (d) thrust bearing. (2)

3. (a) Sketch a cross section through a four stroke diesel engine piston, labelling the MAIN components. (6)
- (b) Describe the transfer of gas force from piston crown through to the crankshaft. (4)

4. Describe the principle of operation of a simple hydraulic governor. (10)

5. (a) Sketch an overspeed trip of the centrifugal type. (6)
- (b) Describe the operation of the overspeed trip sketched in part (a). (4)

6. (a) Sketch a section through the nozzle of a fuel injector, labelling the MAIN components. (6)
- (b) Explain what is meant by EACH of the following terms:
 - (i) atomisation; (2)
 - (ii) penetration. (2)

7. (a) Describe FOUR factors influencing centrifugal separator efficiency. (4)
- (b) Explain how oil loss occurs in a separator, stating how this can be minimised. (4)
- (c) State the factors determining the discharge frequency of an engine lubricating oil purifier. (2)
8. Describe possible reasons for variations in the oil level of a main engine sump. (10)
9. Describe, with the aid of a sketch, the operation of a diesel engine propulsion system air operated radial tyre type clutch. (10)
10. With reference to main reduction gearing:
- (a) explain why lubricating oil should be supplied before the gearing rotates; (4)
- (b) state the condition monitoring techniques that may be employed to assess the condition of the gearing. (6)