

# 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, 23 October 2020

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"><li>1. Candidates should note that 100 marks are allocated to this paper. To pass candidates must achieve 50 marks.</li><li>2. Non-programmable calculators may be used</li><li>3. All formulae used must be stated and the method of working and ALL intermediate steps must be made clear in the answer.</li></ol> |
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Materials to be supplied by examination centres:

Candidate's examination workbook
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## MARINE DIESEL ENGINEERING

Attempt ALL questions

Marks for each part question are shown in brackets

1. With reference to four stroke engines, explain the effects of EACH of the following:
  - (a) advanced fuel injection; (3)
  - (b) retarded fuel injection; (4)
  - (c) low compression pressure. (3)
  
2.
  - (a) Explain why air coolers are fitted after main engine turbo chargers. (6)
  - (b) Explain the effects of undercooling the charge air on the engine. (4)
  
3. Describe a procedure for manually testing the set points on a diesel generator lubricating oil, low pressure alarm and shut down. (10)
  
4. With reference to scroll type fuel injection pumps:
  - (a) describe how the delivered quantity of fuel may be varied; (5)
  - (b) explain the purpose of the delivery valve; (3)
  - (c) describe how fuel oil is prevented from spraying out if the high pressure pipe fails in service. (2)
  
5.
  - (a) Explain what is meant by microbial degradation of a lubricating oil. (4)
  - (b) State FOUR indications that could be observed if a lubricating oil was suffering from microbial degradation. (4)
  - (c) Describe TWO actions that should be taken on detecting the early start of microbial degradation of the main engine lubricating oil. (2)
  
6.
  - (a) Describe, with the aid of a sketch, a keel type cooling water system, labelling the MAIN components. (6)
  - (b) Explain the purpose of EACH of the following in the cooling system:
    - (i) header tanks; (3)
    - (ii) vent lines. (1)

7. The air start pipework on a diesel engine attached to the cylinder head is becoming extremely hot.

Explain EACH of the following:

- (a) the probable cause; (3)
  - (b) the consequences of this situation and the immediate action to be taken; (4)
  - (c) how this problem can be minimised. (3)
8. (a) Describe the procedure for renewing a bottom end bearing of a diesel engine. (8)
- (b) Describe the precautions necessary on initial startup of the engine. (2)
9. Sketch a fluid coupling, suitable for connecting an engine to a gearbox, labelling the main components. (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)