

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, 18 January 2019

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. Non-programmable calculators may be used.2. 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:

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MARINE DIESEL ENGINEERING

Attempt ALL questions

Marks for each part question are shown in brackets

1. With reference to diesel engines, explain EACH of the following terms:
 - (a) top dead centre; (1)
 - (b) bottom dead centre; (1)
 - (c) piston stroke; (2)
 - (d) swept volume; (2)
 - (e) clearance volume; (2)
 - (f) compression ratio. (2)

2. With reference to four stroke diesel engine exhaust valves:
 - (a) explain the effects of EACH of the following:
 - (i) too large a tappet clearance; (4)
 - (ii) too small a tappet clearance; (4)
 - (b) explain why double (nested) valve springs may be fitted. (2)

3. Describe FOUR safety cut outs/trips which may be fitted to a diesel engine, explaining how EACH functions. (10)

4.
 - (a) Describe the operation and purpose of a diesel engine fuel nozzle. (6)
 - (b) State the defects diesel engine fuel nozzles may encounter during service. (4)

5.
 - (a) Describe how contamination of fuel oil by EACH of the following can occur:
 - (i) microbes; (2)
 - (ii) sodium. (2)
 - (b) Describe how to avoid fuel system and engine related problems with reference to the TWO contaminants in part (a). (6)

6. With reference to diesel engine cooling water:
- (a) explain why the water requires treatment; (6)
 - (b) describe the type of treatment that should be used. (4)
7. (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)
8. (a) State TWO possible causes for EACH of the following exhaust emissions:
- (i) black smoke; (2)
 - (ii) blue smoke; (2)
 - (iii) white smoke. (2)
- (b) State ONE remedy for EACH of the emissions in part (a). (3)
- (c) State how combustion defects may be diagnosed. (1)
9. Sketch a hydraulically operated, multi-plate, friction clutch, labelling the main components. (10)
10. With reference to a reduction gearing and pneumatic clutch arrangement of a propulsion system:
- (a) state FIVE protection devices fitted; (5)
 - (b) explain the need for EACH device stated in part (a). (5)