

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, 26 April 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. Describe the combustion process of EACH of the following:
 - (a) petrol engine; (5)
 - (b) diesel engine. (5)

2. With reference to main engine turbo chargers, explain the purpose of EACH of the following:
 - (a) the volute casing; (3)
 - (b) the diffuser; (4)
 - (c) the nozzle ring. (3)

3. Describe, with the aid of a sketch, a valve actuating mechanism for a 4-stroke engine from cam to valve, labelling the MAIN components and showing where the tappet clearance may be measured. (10)

4.
 - (a) Explain the actions which must be taken when the engine crankcase oil mist detector alarm is set-off and accumulation of oil mist is ascertained. (5)
 - (b) Sketch a crankcase explosion relief door, labelling the MAIN components. (5)

5. With reference to distillate fuel oil, explain EACH of the following:
 - (a) why it often needs treatment before the engine; (6)
 - (b) why it sometimes needs cooling after the engine. (4)

6. With reference to the viscosity of diesel engine lubricating oil:
 - (a) explain the meaning of the term viscosity, stating why it is important to the operation of a diesel engine: (3)
 - (b) describe an on board viscosity test to determine if engine lubricating oil is fit for further use; (3)
 - (c) list the factors which will influence the viscosity of oil in service. (4)

7. With reference to the main engine cooling water systems:
- (a) explain the purpose of the header tank; (4)
 - (b) explain why both heaters and coolers may be fitted; (4)
 - (c) state, with reasons, the type of pumps used. (2)
8. With reference to plate type heat exchangers:
- (a) sketch the assembly, labelling the main components and indicating the direction of flow; (5)
 - (b) state the materials used for the plates and seals; (2)
 - (c) state the purpose of the plates being corrugated; (2)
 - (d) state the purpose of *tell tales*. (1)
9. Describe the procedure to be adopted prior to removing a diesel engine cylinder head, including safety precautions. (10)
10. (a) State how gearbox oil may become contaminated with water. (1)
- (b) Explain the effects of water contamination of gearbox oil. (5)
 - (c) Describe the actions to be taken should a gearbox become contaminated with water. (4)