

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, 20 January 2023

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) Explain why the air outlet from the turbocharger should be cooled before entering the diesel engine cylinder. (4)
- (b) Explain why the charge air cooler has fins attached to its tubes. (2)
- (c) State possible reasons why the charge air cooler's performance may be reduced. (4)

2. (a) With reference to the section of timing chain shown in the figure below, identify the component parts A-E. (5)
- (b) Explain the reasons why chains may elongate or slacken in service and the areas that may wear. (5)

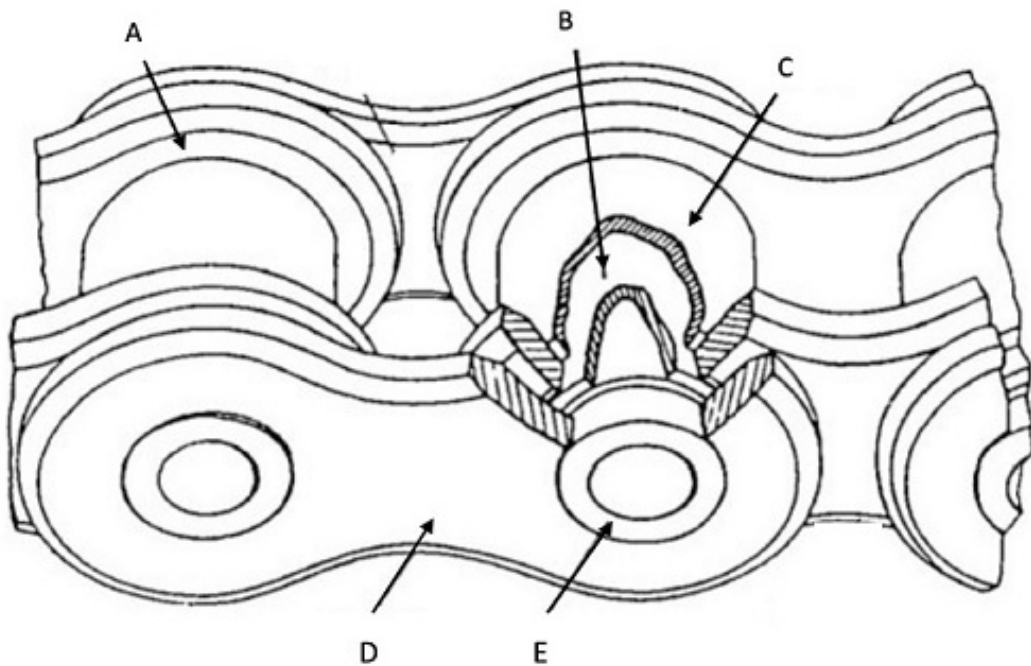


Fig Q2

3. Describe a procedure for manually testing the set points on diesel generator HT cooling water, high temperature alarm and shut down. (10)

4. (a) Sketch a scroll type fuel pump, labelling the main components. (6)
- (b) Explain how the pump sketched in part (a) may vary the end of delivery. (4)
5. With reference to diesel engine fuel:
- (a) explain the meaning of the term *microbial contamination*; (1)
- (b) describe the possible problems the engine may encounter if the fuel received is contaminated with microbes; (4)
- (c) explain how *microbial contamination* can be avoided; (3)
- (d) explain the actions to be taken if *microbial contamination* is severe. (2)
6. (a) State FOUR functions of lubricating oil. (4)
- (b) Explain EACH of the following terms:
- (i) hydrostatic lubrication; (2)
- (ii) boundary lubrication. (2)
- (c) State ONE advantage and ONE disadvantage of using grease as a lubricant in a plain bearing. (2)
7. 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)
8. Describe the possible causes and remedies for EACH of the following diesel engine faults:
- (a) low lubricating oil pressure; (3)
- (b) overheating; (3)
- (c) unstable speed. (4)

9. With reference to friction clutches, state EACH of the following:
- (a) THREE advantages of a wet clutch; (3)
 - (b) THREE disadvantages of a wet clutch; (3)
 - (c) ONE advantage of multiple plates; (1)
 - (d) THREE disadvantages of multiple plates. (3)
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)