

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, 14 May 2021

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. Describe the working principle of the four stroke cycle. (10)

2. With reference to large medium speed diesel engine turbo chargers:
 - (a) explain what is meant by the term *pulse system*; (6)
 - (b) explain the advantage the pulse system has over the constant pressure system. (4)

3. (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)

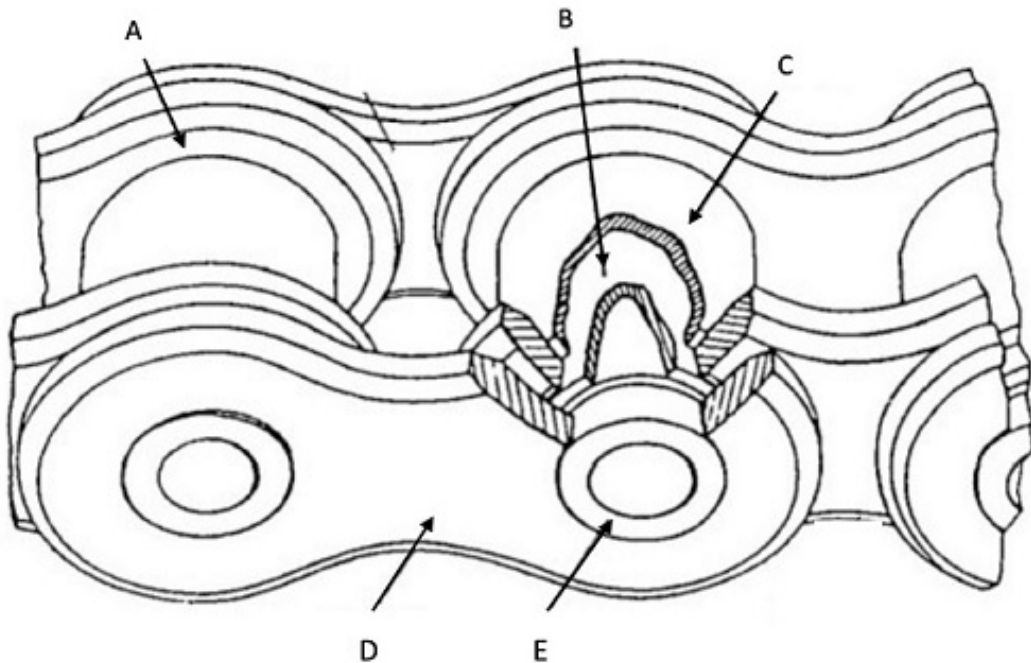


Fig Q3

4. With reference to diesel engine crankcases:
 - (a) explain why crankcases may have relief valves fitted; (3)
 - (b) outline the circumstances which may cause the relief valves to operate; (5)
 - (c) state a safety detection system which may be fitted. (2)

5. 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)

6. With reference to tube type heat exchangers, explain the purpose of EACH of the following:
 - (a) baffle plates; (2)
 - (b) sliding tube plate; (2)
 - (c) tell tale ring; (2)
 - (d) vent cock; (2)
 - (e) anodes. (2)

7.
 - (a) Explain, with the aid of a diagram, the operation of a solenoid operated, battery powered electric starting system for an internal combustion engine. (6)
 - (b) Explain the term pre-engaged starter. (4)

8. With reference to abnormal turbocharger vibration:
 - (a) explain the possible causes whilst operating at a steady speed; (5)
 - (b) describe how the causes explained in part (a) may be minimised. (5)

9. Sketch a hydraulically operated, multi-plate, friction clutch, labelling the main components. (10)

10. With reference to reduction gearing, explain EACH of the following:

- (a) the purpose of the magnetic filter in the lubricating oil system; (3)
- (b) why the surface finish of the gear teeth is important; (4)
- (c) why EP lubricating oil is preferred. (3)