

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, 21 August 2020

1400-1600 hrs

Examination paper inserts:

--

Notes for the guidance of candidates:

- | |
|--|
| <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. |
|--|



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) Sketch a four stroke timing diagram, showing the position of fuel valve, exhaust valve and inlet valve operation. (8)
- (b) Explain the meaning of the term *valve overlap*, stating its purpose. (2)
2. (a) Explain TWO reasons why a turbocharged engine develops greater power than a naturally aspirated engine of similar size and speed.  (6)
- (b) Explain why the air leaving the turbocharger is cooled before entering the engine.  (4)
3. (a) Describe the events leading to a crankcase explosion. (4)
- (b) State the methods of detecting the events of part (a) (2)
- (c) State how the severity of a crankcase explosion may be limited. (4)
4. Describe the essential factors affecting the establishment of *fluid film* lubrication. (10)
5. (a) Describe FOUR factors influencing centrifugal separator efficiency. (4)
- (b) Explain how oil loss occurs in a separator, stating how this can be minimised. (4)
- (c) State the factors determining the discharge frequency of an engine lubricating oil purifier. (2)
6. (a) Describe, with the aid of a sketch, a central cooling water system. (8)
- (b) State the advantage of the system described in part (a). (2)
7. (a) Describe, with the aid of a sketch, the construction of a plate type heat exchanger. (7)
- (b) State THREE advantages of the plate types, compared with the tube type heat exchanger. (3)

8. With reference to diesel engine turbochargers:
- (a) outline the procedure for in-service cleaning the gas side; (6)
 - (b) outline the procedure for in-service cleaning the air side. (4)
9. With reference to clutches, describe the operation of EACH of the following:
- (a) a friction type; (5)
 - (b) a fluid type. (5)
10. Describe, with the aid of a sketch, EACH of the following gear arrangements:
- (a) double reduction; (5)
 - (b) reversing. (5)