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:

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 used
3. 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)