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, 18 June 2021

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. With reference to starting air:

   (a) describe what is meant by the air admission period; (6)

   (b) describe how the air admission period is determined and controlled. (4)

2. With reference to turbocharger air coolers:

   (a) explain the purpose of EACH of the following:

      (i) zinc anodes; (2)

      (ii) tube fins; (2)

      (iii) drain cock on air manifold. (2)

   (b) explain the parameters that could be measured to ascertain cooler performance. (4)

3. List TEN safety devices that may be fitted to a propulsion engine and gearbox arrangement, stating a reason why EACH device is fitted. (10)

4. 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)

5. (a) Explain how the lubricating oil of a diesel engine may become contaminated with water. (6)

   (b) Outline the problems that water in an engine oil may cause. (4)

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 the possible causes of heat exchanger performance reduction. (6)

(b) Describe how the performance of heat exchangers may be determined. (4)

8. (a) Sketch an electric starting motor system, labelling the MAIN components. (5)

(b) With reference to the starting system batteries in part (a):

(i) describe the maintenance checks required to prolong the batteries life; (3)

(ii) describe any safety procedures necessary when handling batteries. (2)

9. With reference to turbochargers:

(a) explain the term *surging*; (5)

(b) describe the indications of *surging*; (2)

(c) describe the causes of *surging*. (3)

10. Describe, with the aid of a sketch, the operation of an epicyclic planetary reduction gear with a fixed annular ring and clock-wise input of the sun wheel. (10)