CERTIFICATES OF COMPETENCY FOR ENGINEERS (YACHT)

EXAMINATIONS ADMINISTERED BY THE
SCOTTISH QUALIFICATIONS AUTHORITY
ON BEHALF OF
MARITIME AND COASTGUARD AGENCY

SMALL VESSEL CHIEF ENGINEER UNLIMITED
SMALL VESSEL CHIEF ENGINEER LIMITED

059-02 - AUXILIARY EQUIPMENT PART II

FRIDAY, 14 May 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

AUXILIARY EQUIPMENT PART II

Attempt ALL questions
Marks for each part question are shown in brackets

1. Describe, with the aid of a sketch, a constant pressure hydraulic power system for a vessel's Anchor Windlass, showing safety features and labelling ALL components of the system. (10)

2. With reference to a 440 Volt, 3-phase motor supplied with six terminal connection in the terminal box:

   (a) sketch a Delta connection, showing the relationship between phase and line voltages; (2)

   (b) sketch a Star connection, showing the relationship between phase and line voltages; (2)

   (c) state the relative speed of both connections; (2)

   (d) sketch and label the terminal link connections so the motor will run in permanent Delta mode. (4)

3. With reference to a solid state (inverter) starter for a 3 phase induction motor:

   (a) explain the starting characteristics of this system; (4)

   (b) list the advantages and disadvantages when compared to conventional starting methods. (6)

4. (a) State THREE reasons for the operation of a *High Pressure Cut-out* in a vapour compression refrigeration system. (3)

(b) Describe the operation of the High Pressure Cut-Out, employed in a vapour compression refrigeration system shown in the figure. (7)

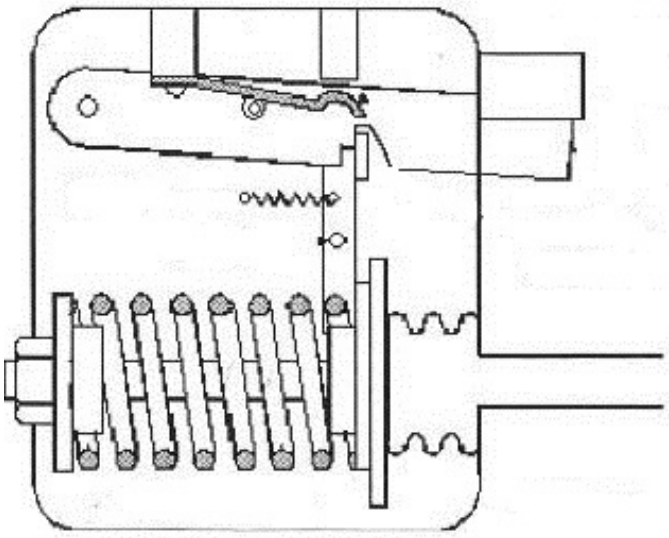

Fig Q4

5. Describe, with the aid of a sketch, a vapour-compression refrigeration cycle, showing clearly the physical state and condition of the refrigerant in the system. (10)

6. With reference to a reciprocating air compression:

(a) define the term *Volumetric Efficiency*; (4)

(b) explain how the operation of the suction and delivery valves affect the volumetric efficiency of the compressor. (6)

7. The lifting arrangement shown in the figure, has two slings, A, with a SWL of 5 tonnes, four slings, B, with a SWL of 2.5 tonnes with a ring and beam each of which have a SWL of 12 tonnes .
Explain the suitability or otherwise of this arrangement for lifting a generator engine, including flywheel, weighing 8 tonnes that has certified lifting points, 2 at each end of the entablature, 6 m apart. (10)

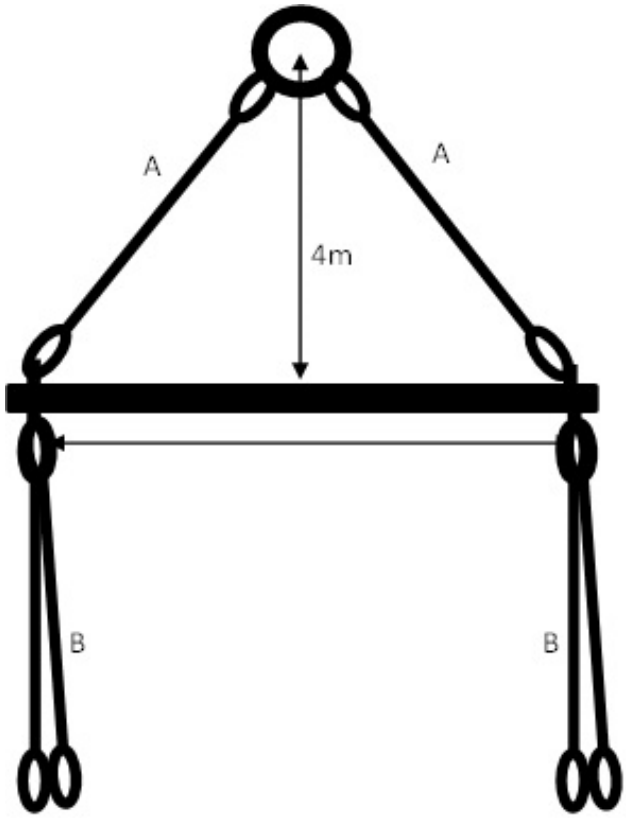

Fig Q7

8. With reference to Open Flame Gas Installation, describe the safety requirements for the installation of EACH of the following:

(a) cylinders and attachments; (5)

(b) fittings and pipework. (5)

9. (a) Describe, with the aid of a sketch, the securing arrangement for a pipe passing through a watertight bulkhead. (5)

(b) Sketch an arrangement for a watertight electric cable gland labelling ALL components. (5)

10. Explain the cause and effect of vibration on a vessel. (10)