

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, 30 November 2018

1400-1600 hrs

Examination paper inserts:

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Notes for the guidance of candidates:

<ol style="list-style-type: none">1. Non-programmable calculators may be used.2. 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 sketches, how an axial piston pump can vary the volume of liquid it displaces. (10)

2. With reference to a crane operated by a constant pressure hydraulic system incorporating unidirectional, fixed displacement pumps that run continuously, explain EACH of the following:
 - (a) the purpose of the accumulator; (2)
 - (b) how the hydraulic pressure is regulated; (2)
 - (c) how the speed and direction of the hoist motor is varied; (3)
 - (d) how the torque available from the hoist motor can be varied. (3)

3. 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)

4. 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)

5. (a) Explain EACH of the following refrigeration terms:
 - (i) superheated; (2)
 - (ii) saturation temperature; (2)
 - (iii) sub-cooled. (2)
 - (b) Sketch a basic vapour compression refrigeration system, showing the refrigerants condition as explained in part (a). (4)

6. (a) State THREE types of damper that may be used to control the airflow in an air conditioning system. (3)

(b) Describe, with the aid of a sketch, an automatic fire damper installed in a vertical air duct or in those that pass through bulkheads designated as fire boundaries. (7)

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 8.5 tonnes that has certified lifting points, 2 at each end of the entablature, 6 m apart. (10)

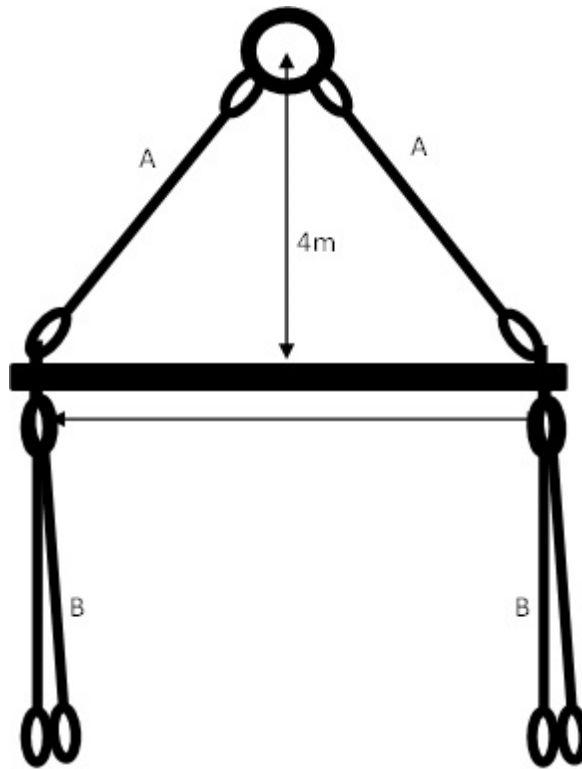


Fig Q7

8. Describe the procedure that should be followed if an outboard motor has been submerged in sea water. (10)

9. (a) List THREE defects that may be found during an inspection of a fixed bladed propeller, stating the possible cause of EACH. (6)

(b) State the likely consequences if the defects stated in part (a) are not rectified. (4)

10. With reference to the application of protective coatings to a vessel's hull:

- (a) state the functions that the coating should perform; (3)
- (b) state the legislation that applies to certain coatings and what certification is required to comply with it; (2)
- (c) outline the process for re-coating the hull of a vessel in drydock. (5)