CERTIFICATES OF COMPETENCY FOR ENGINEERS (YACHT)

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

STCW 95 CHIEF ENGINEER (REG. III/2) – "YACHT 2"

052-02 APPLIED MARINE ENGINEERING

FRIDAY, 13 MARCH 2009

1400 - 1600 hrs

Examination paper inserts:

Notes for the guidance of candidates:

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

APPLIED MARINE ENGINEERING

Attempt ALL questions

Marks for each question are shown in brackets

1. (a) State the approximate weight ratio of aluminium to steel. (1)

   (b) State the approximate melting point of aluminium. (1)

   (c) Explain the naturally occurring process that improves the corrosion resistance of aluminium. (3)

   (d) Describe the precautions that may be taken when welding aluminium to prevent cracking. (5)

2. Explain EACH of the following annealing processes, stating when these may be necessary for plain carbon steels:

   (a) normalising; (3)

   (b) full annealing; (3)

   (c) spheroidizing; (2)

   (d) stress relief. (2)

3. Describe the differences between a synthetic lubricating oil and a mineral lubricating oil. (10)

4. (a) Explain what is meant by the flash point of a fuel oil, outlining the importance of the flash point value for the storage of fuel oils. (4)

   (b) Explain how the flash point of a lubricating oil may change in service. (2)

   (c) Explain why a fuel or lubricating oil is heated before treatment in a *centrifugal separator.* (4)

5. (a) Sketch a diagrammatic arrangement showing a brushless a.c. generator. (5)

   (b) Explain the operation of this arrangement. (5)

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6. (a) Explain the term *neutral point insulated* distribution. (2)

(b) Describe the advantages and disadvantages of a neutral point insulated system compared with an earthed neutral point system. (8)

7. With reference to battery installation on board:

(a) explain the term *vented type battery*; (2)

(b) explain the term *sealed type battery*; (2)

(c) for battery banks with a charging power greater than 2kW, detail the regulations governing the installation, ventilation and location for EACH of the following:

(i) vented type batteries; (4)

(ii) sealed type batteries. (2)

8. With reference to paralleling and load sharing of generators, explain EACH of the following:

(a) the possible causes of no voltage indication on start up of a stand-by generator; (2)

(b) the purpose of the 'no voltage protection interlock'; (2)

(c) the reason for the incoming machine to be running slightly faster than the busbar frequency at the instant of closing the incoming breaker; (2)

(d) how equal kVAr load sharing is maintained; (2)

(e) why the power factors may be different even though the kW loads are equal. (2)

9. Explain EACH of the following control terms:

(a) settling time; (2)

(b) stability; (2)

(c) dead zone; (2)

(d) hysteresis; (2)

(e) bandwidth. (2)

10. (a) Comparing hydraulic and mechanical governors:

(i) describe TWO advantages of hydraulic governors; (2)

(ii) describe TWO disadvantages of hydraulic governors. (2)

(b) Explain the purpose of EACH of the following hydraulic governor features:

(i) the accumulator; (2)

(ii) the power piston; (2)

(iii) the pilot valve system. (2)