# 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, 21 NOVEMBER 2008**

**1400 - 1600 hrs**

Examination paper inserts:

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Notes for the guidance of candidates:

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| 1. Non-programmable calculators may be used.<br>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:

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| Candidate's examination workbook |

**APPLIED MARINE ENGINEERING**

**Attempt ALL questions**

**Marks for each question are shown in brackets**

1. (a) Sketch the surface appearance of a fatigue fracture. (4)

   (b) Describe the different areas visible in the fracture, explaining the reasons for the different markings. (6)

2. Explain EACH of the following terms:

   (a) galvanic corrosion; (2)

   (b) cavitation damage; (2)

   (c) erosion damage; (2)

   (d) stress corrosion; (2)

   (e) stray current corrosion. (2)

3. (a) List the problems that fluid aeration may cause in an oil system. (5)

   (b) Describe the possible sources of bubble formation (aeration) within an oil circulation system. (5)

4. (a) Explain what is meant by *microbial degradation* of a lubricating or fuel oil. (4)

   (b) State SIX indications that might be observed in a lubricating oil suffering from microbial degradation. (4)

   (c) Describe TWO actions that could be taken on detecting the *early* start of microbial contamination to limit development of the micro organisms. (2)

5. Explain the purpose of EACH of the following engine air start safety devices:

(a) automatic non-return valve; (2)

(b) air line drain valves; (2)

(c) manifold safety valve; (2)

(d) turning gear interlock; (2)

(e) zero pitch interlock. (2)

6. (a) Compare the effects of earth leakage occurring in an earthed distribution system and in an insulated distribution system. (6)

(b) State the reasons why an instrument type earth leakage detector will be fitted in preference to simple earth lamps. (4)

7. Outline the MCA guidelines with regard to EACH of the following:

(a) testing on 'live' or 'dead' circuits; (1)

(b) connection of amp-meters; (1)

(c) checks of test equipment; (1)

(d) personnel allowed to carry out work; (1)

(e) permit-to-work; (1)

(f) test equipment; (1)

(g) test leads; (1)

(h) personnel not directly involved in the operation; (1)

(i) conducting tips of probes; (1)

(j) scheduling of electrical maintenance work. (1)

8. (a) Sketch a labelled diagram of an emergency battery system with charging from an a.c. supply, showing the means for automatic connection of the battery power to the emergency supply. (8)

(b) Explain how the battery system sketched in Q8(a) may be tested to ensure connection to the emergency supply on loss of the main power. (2)

9. With reference to the control loop block diagram shown in Fig Q9, explain the function of EACH of the following:

(a) measurement transmitter; (2)

(b) control station; (2)

(c) PID controller; (2)

(d) control valve; (2)

(e) manual / auto option. (2)

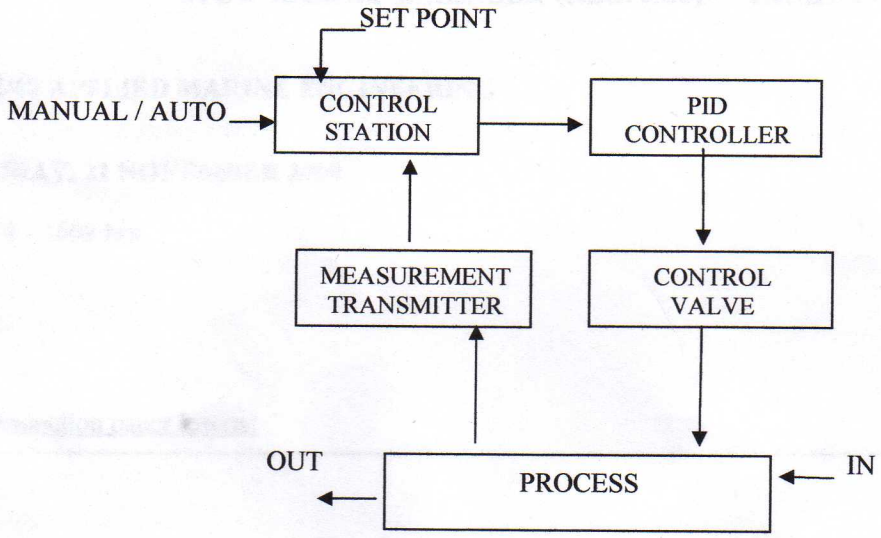


Fig Q9

10. Explain EACH of the following terms:

(a) EPROM; (2)

(b) integral action; (2)

(c) hysteresis; (2)

(d) split range control; (2)

(e) error squared. (2)