**APPLIED MARINE ENGINEERING** Jun '04

**Attempt ALL questions**

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

1. Explain how the properties of steel can be changed by the addition of EACH of the following elements:

   (a) nickel; (2)

   (b) chromium; (2)

   (c) molybdenum; (2)

   (d) silicon; (2)

   (e) copper. (2)

2. Explain EACH of the following engineering terms:

   (a) hardness; (2)

   (b) proof stress; (2)

   (c) ultimate tensile strength (UTS); (2)

   (d) Young's Modulus; (2)

   (e) yield stress. (2)

3. Explain EACH of the following annealing processes and why these may be necessary for plain carbon steels:

   (a) normalising; (3)

   (b) full annealing; (3)

   (c) spheroidizing; (2)

   (d) stress relief. (2)

4. Describe the essential factors affecting the establishment of *fluid film* lubrication. (10)

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5. List the immediate actions to be taken when EACH of the following alarms is activated:

(a) main engine high oil mist; (2)

(b) main engine individual cylinder exhaust temperature deviation; (2)

(c) electrical distribution earth fault leakage; (2)

(d) main generator over-current (overload) alarm; (2)

(e) main engine, main bearing, high temperature. (2)

6. Describe FIVE safety devices that may be fitted to an a.c. induction motor and its associated control gear to protect the motor against burnout. (10)

7. Explain how EACH of the following electrical safety devices may be tested for correct operation:

(a) generator reverse power trip; (2)

(b) generator over-current alarm; (2)

(c) generator over-current trip; (2)

(d) emergency generator auto start up; (2)

(e) preferential tripping sequence. (2)

8. Explain EACH of the following control valve types with respect to position and gain achievable:

(a) linear; (2)

(b) equal percentage; (4)

(c) quick opening. (4)

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9. Fig.Q9 shows a tank filling with fluid at a variable rate, and an output regulated manually by an operator controlling a valve.

*Note: fluid flow in will always be less than the maximum flow out with the valve full open.*

Explain, with the aid of a control block diagram, the control process taking place that enables the operator to maintain a constant tank level, *h*, for varying rates of fluid flow input. (10)

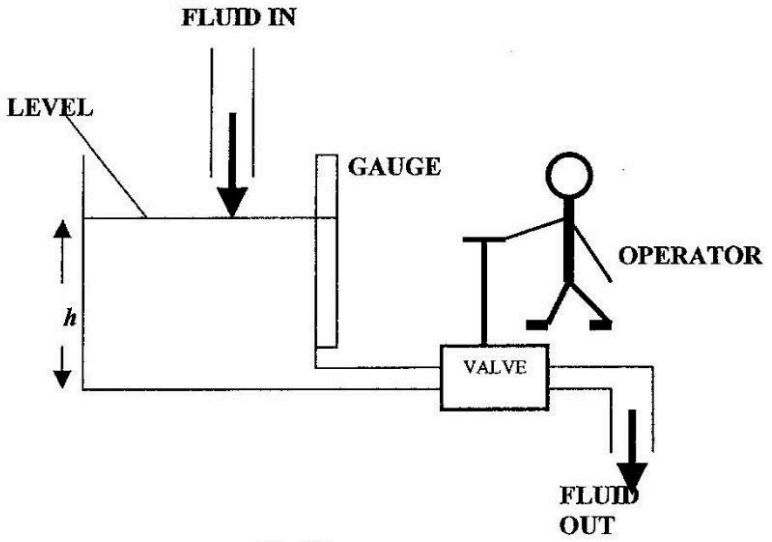


Fig Q9

10. State TWO advantages and TWO disadvantages for EACH of the following temperature sensors:

(a) thermocouple; (2)

(b) resistance temperature detector; (2)

(c) thermistor; (2)

(d) bimetallic element; (2)

(e) fluid filled system. (2)