

ALL questions
marks for each part question are shown in brackets

1. With reference to carbon fibre:
- (a) describe how the base raw material is turned into a useable carbon fibre; (2)
 - (b) describe how the fibres produced in part (a) are turned into a usable product; (2)
 - (c) explain how its internal structure gives it its unique strength properties; (4)
 - (d) list FOUR properties of carbon fibre that make it desirable for marine fabrication. (2)
2. (a) State the TWO steps occurring in the fracture process of a material. (2)
- (b) Explain EACH of the following fracture failures: (2) ⁶
- (i) highly ductile fracture; *CIC* (2)
 - (ii) moderately ductile fracture; *S CIC* (2)
 - (iii) brittle fracture. *Perpendicular* (2)
- (c) Explain the process of *fatigue failure* and its significance in engineering design. (2)
3. (a) Explain EACH of the following terms:
- (i) plasticity; (2)
 - (ii) shear stress; (2)
 - (iii) Young's modulus; (2)
 - (iv) safety coefficient (factor of safety). (2)
- (b) State TWO factors that may influence the safety coefficient in operation. (2)
4. (a) Explain the process of *brazing* for the joining of metals and alloys. (4)
- (b) State TWO methods by which a cracked aluminium alloy pump casting might be repaired. (2)
- (c) List the FOUR functions that the flux performs in the brazing process. (4)

6. (a) With reference to fretting corrosion: (3)
- (i) explain the process; (1)
 - (ii) state a common cause; (1)
 - (iii) state how it is normally detected. (6)
- (b) With reference to pitting corrosion: (1)
- (i) explain the term *pitting corrosion*; (2)
 - (ii) state TWO common causes; (2)
 - (iii) explain why it is considered to be dangerous. (2)
7. With reference to root whitening in GRP hull construction:
- (a) explain the term *root whitening*, stating where it is most likely to occur; (2)
 - (b) explain TWO possible reasons why this may happen; (4) (?)
 - (c) state TWO possible actions that could be taken if it is discovered. (4)
7. Describe, with the aid of a sketch, a floatation device that produces an output signal to remotely control the liquid level in a tank. (10) (6)
8. (a) Describe, with the aid of a sketch, the principle and operation of a potentiometer. (6)
- (b) Explain how a potentiometer can be used to measure rotary movement. (4) (5)
9. With reference to a main engine lubricating oil system, explain, with the aid of a sketch, the principle of a *closed loop* temperature control system. (10) (6)

10. (a) Identify components A, B, C, D, E, F, G and H shown in the figure.
(b) Explain the difference between a *strainer* and a *filter* in a hydraulic circuit.

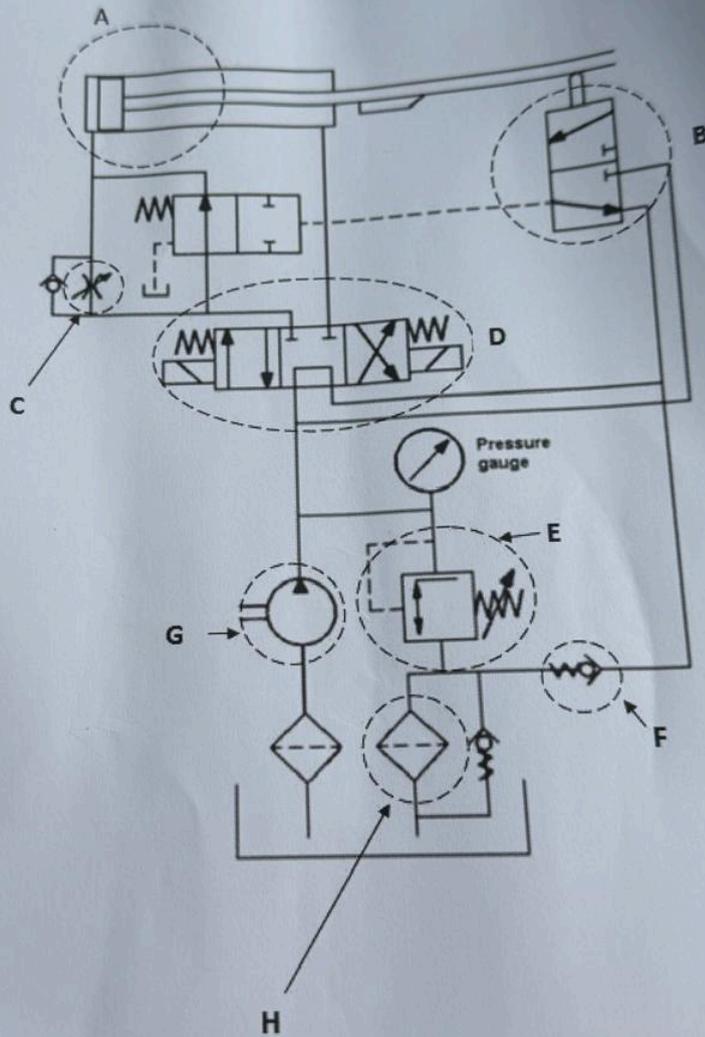


Fig Q10