

**APPLIED MARINE ENGINEERING****Attempt ALL questions****Marks for each part question are shown in brackets**

- ① With reference to the manufacture of carbon fibre components:
- (a) describe EACH of the following processes and its advantages:
    - (i) vacuum bagging; (2)
    - (ii) autoclave curing; (2)
    - (iii) resin transfer moulding. (3)
  - (b) list the type of component that EACH process described in part (a) is best suited to. (3)
- ② With reference to case hardening steel components:
- (a) describe the changes that occur with this process; (3)
  - (b) explain why it may be required; (2)
  - (c) describe EACH of the following processes:
    - (i) a simple shipboard process; (3)
    - (ii) solid pack carburising. (2)
- ③
- (a) List FOUR methods for non-destructive crack detection. (4)
  - (b) Describe TWO procedures from the methods listed in part (a). (6)
- ④ 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)

5. State, with reasons, a different welding/brazing/soldering process that is best suited to effect EACH of the following situations:

- (a) joining two lengths of aluminium bronze seawater pipe, both pipes having the same diameter; (2)
- (b) attaching a stainless steel handrail to a steel hull; (2)
- (c) re-attach a section of broken flange on a cast iron pump casing; (2)
- (d) attaching a brass flange onto a stainless steel pipe; (2)
- (e) attaching a 1.0 mm steel section to 10 mm thick deckhead plate. (2)

6. With reference to Impressed Current Cathodic Protection of a vessel's hull:

- (a) explain why it may be required; (2)
- (b) describe, with the aid of a sketch, the key points of installation; (5)
- (c) describe its operating principle. (3)

7. With reference to a thermistor:

- (a) state the materials used in their construction, the principle of operation and the reason for their use on vessels; (4)
- (b) state the temperature range over which they are able to operate; (1)
- (c) state, with reasons, FIVE applications where thermistors may be found on board a vessel. (5)



8. State a type of transducer or measuring device suitable for measuring EACH of the following parameters:

- (a) accurate remote reading of a diesel engine exhaust temperature; (1)
- (b) accurate remote reading of the twist of a propeller shaft; (1)
- (c) accurate and remote position of a diesel engine governor or fuel rack; (1)
- (d) the speed of a ship's main propeller shaft in RPM; (1)
- (e) remote reading of a ship's intermediate shaft bearing temperature; (1)
- (f) remote reading of lubricating oil pressure in a diesel engine; (1)
- (g) flow rate of a water maker; (1)
- (h) simple local pressure reading of ships fire-main; (1)
- (i) the position of the steering gear or rudder; (1)
- (j) local reading of jacket cooling water temperature. (1)

9. With reference to pneumatic actuators:

- (a) explain why some applications may be best suited to use a pneumatic powered actuator and others may be more suited to using an electrically powered actuator; (6)
- (b) describe ONE advantage and ONE disadvantage of a pneumatically powered valve; (2)
- (c) describe ONE advantage and ONE disadvantage of an electrically powered valve. (2)

10. (a) Identify components A, B, C, D, E, F, G and H shown in the figure. (8)  
 (b) Explain the difference between a *strainer* and a *filter* in a hydraulic circuit. (2)

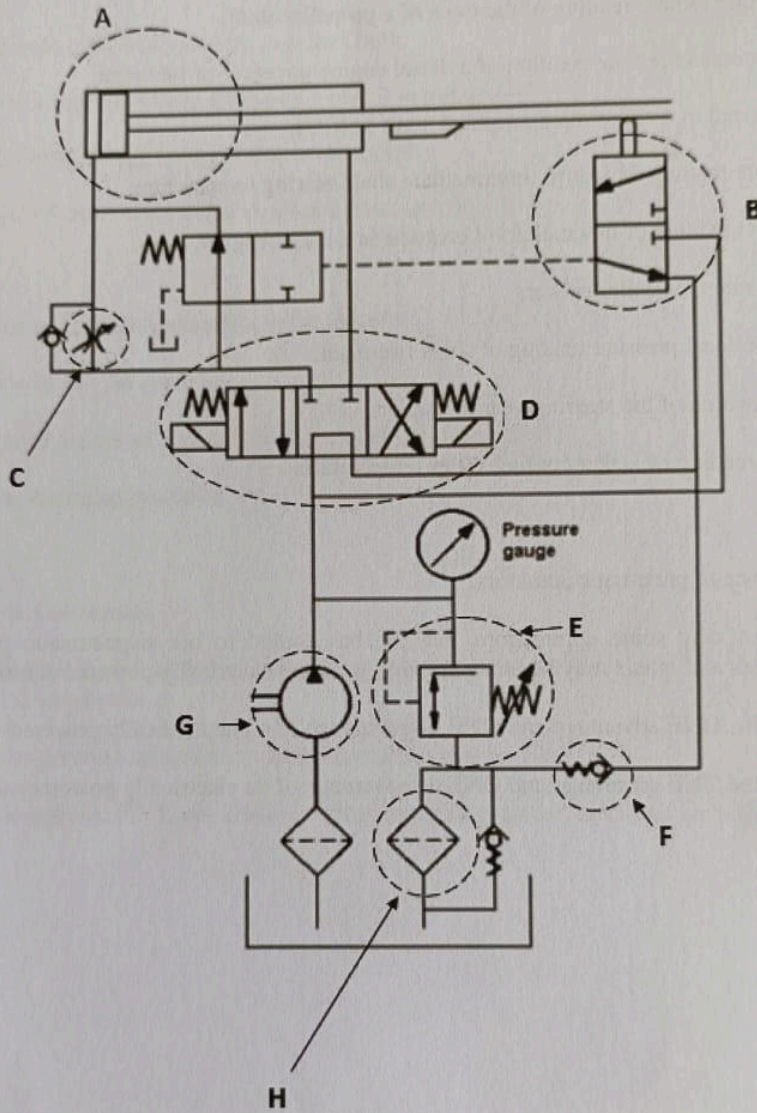


Fig Q10