

## APPLIED MARINE ENGINEERING

Attempt 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; (2)
  - (d) list FOUR properties of carbon fibre that make it desirable for marine fabrication. (4)
2. With reference to aluminium:
- (a) explain what is meant by *work hardening*; (2)
  - (b) describe the internal changes when it becomes work hardened; (2)
  - (c) state the effect work hardening has on its properties; (2)
  - (d) describe how it could be annealed on board a vessel. (4)
3. Explain EACH of the following terms:
- (a) ductile cast iron; (2)
  - (b) tensile stress; (2)
  - (c) work hardening; (2)
  - (d) shear stress; (2)
  - (e) Young's modulus. (2)
4. List THREE advantages and TWO disadvantages for EACH of the following welding processes:
- (a) gas tungsten arc welding (TIG); (5)
  - (b) covered electrode welding. (5)

— 5. With reference to marine corrosion:

- (a) list EIGHT factors that influence the rate of corrosion for an unprotected metal surface; (4)
- (b) explain the process of galvanic corrosion; (4)
- (c) state TWO major factors influencing the severity of galvanic corrosion. (2)

— 6. (a) Explain how *osmosis* may occur in a fibre glass hull. (4)

(b) Explain how the likelihood of *osmosis* occurring in the future can be reduced during the manufacturing process of the hull. (4)

(c) Explain how *osmosis* may be detected in service. (2)

— 7. With reference to an impeller type flowmeter, describe how an output is produced and processed to provide EACH of the following:

(a) an analogue output in litres per minute; (5)

(b) a digital output in litres per minute. (5)

★ 8. With reference to the flowrate measuring device shown in the figure, describe the principle of operation, explaining how an analogue remote reading may be obtained. (10)

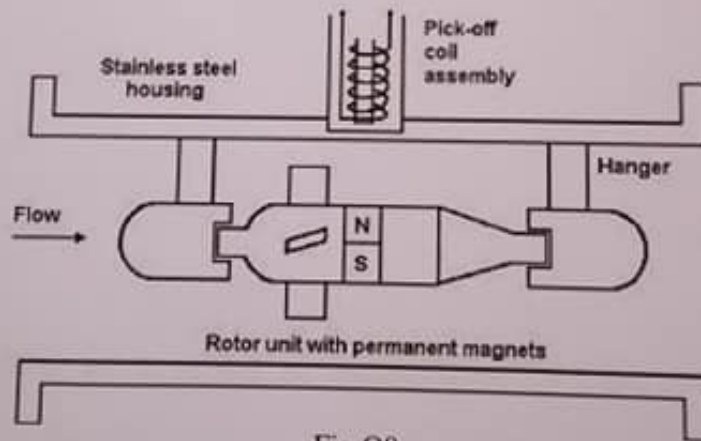


Fig Q8

9. With reference to *Discontinuous* or *On Off* control systems:

(a) sketch the response of a basic heater control, showing temperature against time and labelling the key points; (4)

— (b) state THREE methods of improving the accuracy/speed of response. (6)

- Q10. (a) Describe, with the aid of a control block diagram, how a governor maintains the speed of a diesel engine driving a generator. (6)
- (b) Describe the reasons for Integrating the error signal and the effect it has on the governor fuel rack. (4)