C14–M–**405**

4481

BOARD DIPLOMA EXAMINATION, (C–14)

MARCH/APRIL—2016

DME—FOURTH SEMESTER EXAMINATION

FLUID MECHANICS AND HYDRAULIC MACHINERY

Time : 3 hours] [*Total Marks* : 80

PART—A 3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

1. Define the following fluid properties : 1½+1½

   (a) Viscosity

   (b) Surface tension

2. Define *(a)* gauge pressure, *(b)* atmospheric pressure and *(c)* absolute pressure. 1+1+1

3. State the equation of continuity of flow and mention the units of the contents in it. 1½+½+½+½

4. Draw a neat sketch of venturi meter and label the parts. 3

5. Write Darcy's formula for loss of head due to friction in a pipe flow *(a)* in terms of velocity of flow and *(b)* in terms of discharge. 1½+1½

6. What is syphon? State its function. 1½+1½

7. A jet of water 75 mm in diameter strikes normally on a fixed flat vertical plate. Determine the force exerted by the jet, when the jet strikes the plate with a velocity of 25 m/s. 3

8. Draw the layout of hydroelectric power plant and indicate the elements of the plant. 3

9. Write any three differences between impulse turbine and reaction turbine. 1+1+1

10. What is cavitation? State its effects. 1½+1½

PART—B 10×5=50

Instructions : (1) Answer *any* **five** questions.

                (2) Each question carries **ten** marks.

                (3) Assume suitable data, missing if any.

11. *(a)* The clearance between an 80 mm diameter shaft and its journal bearing is 0·75 mm. If the shaft rotates at 100 r.p.m, find the shear stress induced in the lubricant. [Take μ = 0·1 Ns/m^2] 6

      (b) Convert 8 $\times$ 10^5 N/m^2 into the following pressure heads : 4

         (i) Equivalent water height

         (ii) Equivalent mercury height

12. A horizontal venturi meter, 30 cm × 15 cm, discharges 80 liter/sec. If the difference of the pressure head between inlet and throat is 1·5 m of water, find the coefficient of discharge of venturi meter.

13. Find the maximum power transmitted through a pipe of 100 mm diameter and 2 km long. The supply head is 4·9 kPa. [Take f = 0·01]

14. A jet of water of diameter 30 cm enters a fixed curved vane with a velocity of 40 m/s at an angle of 20° to the horizontal. If the jet leaves the vane at 15° to the horizontal, find the normal and tangential forces exerted by the jet.

15. *(a)* Draw the velocity triangles for a jet of water striking a moved curved vane at one trip. 5

(b) Write any five differences between Francis turbine and Kaplan turbine. 5

16. The pitch diameter of Pelton wheel is 0·75 m and is running at 750 r.p.m. The net head on the Pelton wheel is 600 m. The angle of deflection of the jet is 165° and the discharge through nozzle is 0·1 m^3/s. Find *(a)* power supplied at the inlet of the jet and *(b)* hydraulic efficiency of the Pelton wheel.

17. A double-acting reciprocating pump running at 50 r.p.m. is discharging 900 liters of water per minute. The pump has a stroke of 400 mm and piston diameter is 250 mm. The suction and delivery heads are 4 m and 25 m respectively. Determine the slip and power required to drive the pump.

18. Explain the working of a centrifugal pump with neat sketch.

5+5

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