



C14-M-405

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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

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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 $\mu = 0.1 \text{ Ns/m}^2$] 6
- (b) Convert $8 \times 10^5 \text{ N/m}^2$ 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 $0.1 \text{ m}^3/\text{s}$. 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
