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Total No. of Questions : 18

B.Tech. (AE) (2018 Batch) (Sem.–3)

FLUID MECHANICS AND FLUID MACHINES

Subject Code : BTAE-303-18

M.Code : 76401

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

Answer briefly :

1. What is the difference between gauge pressure and absolute pressure?
2. What is viscosity? What is the cause of it in liquids and in gases?
3. List the causes of minor energy losses in flow through pipes.
4. What is the difference between a laminar flow and turbulent flow?
5. Define and explain Reynolds number, Froude's number, Euller's number and Mach number.
6. Define "SLIP" of reciprocating pump. When does the negative slip occur?
7. Classify pumps on the basis of transfer of mechanical energy.
8. What is draft tube and explain its function?
9. Define hydraulic efficiency of a turbine.
10. Draw velocity triangle diagram for Pelton Wheel turbine.

SECTION-B

11. a) Explain the properties of a hydraulic fluid.

    b) A 0.5 m shaft rotates in a sleeve under lubrication with viscosity 5 poise at 200 rpm. Calculate the power lost for a length of 100 mm if the thickness of the oil is 1 mm.

12. Derive an expression for head loss through pipes due to friction.

13. A single acting reciprocating pump running at 50 rpm. delivers 0.01 m^3/s of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine the theoretical discharge of the pump, coefficient of discharge and slip and the percentage slip of the pump.

14. Explain with the help of a diagram, the essential features of a Kaplan Turbine.

15. Write short notes on the following :

    a) Dimensionless Homogeneity with example.

    b) Euler Model Law.

SECTION-C

16. In an inward radial flow turbine, water enters at an angle of 22° to the wheel tangent to the outer rim and leaves at 3 m/s. The flow velocity is constant through the runner. The inner and outer diameters are 300 mm and 600 mm respectively. The speed of the runner is 300 mm. The discharge through the runner is radial. Find the :

    a) Inlet and outlet blade angles

    b) Taking inlet width as 150 mm and neglecting the thickness of the blades, find the power developed by the turbine.

17. The efficiency (η of a fan depends on ρ (density), μ (viscosity) of the fluid. ω (angular velocity), d (diameter of rotor) and Q (discharge). Express η in terms of non- dimensional parameters. Use Buckingham's π theorem.

18. a) A power transmission pipe 10 cm diameter and 500 m long is fitted with a nozzle at the exit, the inlet is from a river with water level 60 m above the discharge nozzle. Assume f = 0.02. Calculate the maximum power which can be transmitted and the diameter of nozzle required.

    b) A horizontal Venturi meter with inlet diameter 200 mm and throat diameter 100 mm is employed to measure the flow of water. The reading of the differential manometer connected to the inlet is 180 mm of mercury. If $C_d = 0.98$, determine the rate of flow.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.