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SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E-MECH/M&P/AERO/AUTO

Title of the Paper: Fluid Mechanics and Machinery Max. Marks: 80

Sub. Code: 6C0066

Time: 3 Hours

Date: 16/11/2010

Session: FN

PART - A

(10 X 2 = 20)

Answer ALL the Questions

1. Define compressibility.
2. What are types of manometers?
3. Define continuity equation.
4. What are the types of notches?
5. What are the minor losses in pipe?
6. What do you mean by vena contracta?
7. Define the specific speed of a pump.
8. What do you mean by cavitation in a pump?
9. What is hydraulic turbine? State its types.
10. What are the types of similitude?

PART – B
Answer All the Questions

(5 x 12 = 60)

11. Calculate the dynamic viscosity of oil, which is used for lubrication between square plate of size 0.8 m x 0.8 m and an inclined plane with an angle of inclination 30. The weight of plate is 300 N and it slides down the inclined plane with uniform velocity of 0.3 m/s. The thickness of oil film is 1.5 mm.

(or)

12. Calculate the capillary effect in mm in a glass tube of 4 mm diameter when immersed in (a) Water and (b) mercury. The temperature of the liquid is 20°C and the values of surface tension of water and mercury at 20°C in contact with air are 0.073575 N/m and 0.51 N/m respectively. The angle of contact for water is zero that for mercury 130°. Take density of water as 998 kg/m³.

13. Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter, the pipe branches. Branch CD is 0.8 m in diameter and carries one-third of flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE.

(or)

14. Derive the expression for the rate of flow of fluid through venturimeter.

15. Derive the Darcy-Weisbach equation for the pipe.

(or)

16. At a sudden enlargement of a water main from 240 mm to 480 mm diameter, the hydraulic gradient rises by 10 mm. Estimate the rate of flow.

17. Discuss the construction and working of a Reciprocating pump.

(or)

18. A centrifugal pump is to discharge 0.118 m^3 at a speed of 1450 rpm against a head of 25 m. The diameter and width of the impeller at outlet are 250 mm and 50 mm respectively. If the manometric efficiency is 75%, determine the vane angle at the outlet.
19. A pelton wheel is to be designed for the following specifications: Shaft power=11772 kW; Head = 380 m; Speed =750 rpm; overall efficiency = 86%; Jet diameter is not to exceed one-sixth of the wheel diameter. Determine: (a) The wheel diameter (b) The number of jets required and (c) Diameter of jet. Take $K_{v1} = 0.985$ and $K_{u1} = 0.45$ where, K_{v1} = Coefficient of velocity and K_{u1} =speed ratio.

(or)

20. The pressure difference Δp in a pipe of diameter D and length l due to viscous flow depends on the velocity V , viscosity μ , density ρ , obtain an expression for Δp , using Buckingham's π theorem.