SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act,1956)

Course & Branch :B.E - AERO/AUTO/M&P/MECH
Title of the Paper :Fluid Mechanics and Machinery Max. Marks :80
Sub. Code :6C0066 Time : 3 Hours
Date :27/04/2010 Session :AN

PART - A (10 x 2 = 20)

Answer ALL the Questions

1. What is capillarity?

2. Define total pressure and centre of pressure.

3. State Bernoulli's theorem.

4. Define continuity equation.

5. Write a formula for calculating loss of head due to sudden enlargement.

6. Define equivalent pipe.

7. What is the significance of characteristics curves?

8. Define indicator diagram.

9. What are the types of draft tube?

10. What are repeating variables?

PART – B (5 x 12 = 60)

Answer ALL the Questions

11. (a)Two horizontal flat plates are placed 0.15 mm apart and the space between them is filled with an oil of viscosity 1 poise. The upper plate of area $1.5m^2$ is required to move with a speed of 0.5 m/s relative to the lower plate. Determine the necessary force required to maintain this speed. (8)
(b) Distinguish between ideal fluids and real fluids. (4)

(or)

12. (a) An isosceles triangular plate of base 3m and altitude 3m is immersed vertically in an oil of specific gravity 0.8. The base of the plate coincides with the free surface of oil. Determine total pressure on the plate and centre of pressure. (8)
(b) Define buoyancy and Meta-centric height. (4)

13. Explain in detail about the various classification of fluid flows.

(or)

14. A 30cm x 15cm venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9, the flow being upwards. The difference in elevations of the throat section and entrance section of the venturimeter is 30cm. The differential U-tube mercury manometer shows a gauge deflection of 25cm. Calculate (i) the discharge of the oil and (ii) the pressure difference between the entrance and throat section. Take the discharge coefficient as 0.98 and the specific gravity of mercury as 13.6.

15. Derive an expression for the loss of head due to friction in pipes and also obtain the relationship between co-efficient of friction and shear stress.

(or)

16. Water discharges at the rate of 98.2 litres per second through a 12cm diameter vertical sharp edged orifice placed under a

constant head of 10 metres. A point, on the jet, measured from the vena-contracta has co-ordinates 4.5 metres horizontal and 0.54 metres vertical. Find the hydraulic coefficients of the orifices.

17. The impeller of a centrifugal pump is of 30 cm diameter and 5 cm width at the periphery and has blades whose tip angles incline backwards 60° from the radius. The pump delivers 17 m^3/min and the impeller rotates at 1000 rpm. Assuming that the pump is designed to admit radially, calculate (i) speed and direction of water as it leaves the impeller, (ii) torque exerted by the impeller on water, (iii) shaft power required and (iv) lift of the pump. Take mechanical efficiency as 95% and hydraulic efficiency as 75%.

(or)

18. (a) Write a short notes on types of casing in centrifugal pump.
(b) Define slip and negative slip in reciprocating pump.

19. The following data relate to a Pelton wheel turbine is given below. Head at the base of the nozzle = 82m, diameter of the jet = 100 mm, discharge of the nozzle = 0.3m^3/s, shaft power = 206kW. Determine the power lost in nozzle and power lost due to hydraulic resistance in water.

(or)

20. The resistance R experienced by a partially submerged body depends upon the velocity V, length of the body 1, viscosity of the fluid μ, density of the fluid ρ and gravitational acceleration g. Obtain a dimensionless expression for R using Buckingham's theorem.