SATHYABAMA UNIVERSITY

(Established under section 3 of UGC Act, 1956)

Course & Branch: B.E – Mechanical /M&P/Aeronautical
Title of the paper: Fluid Mechanics and Machinery
Semester: III Max. Marks: 80
Sub.Code: 6C0066 Time: 3 Hours
Date: 10-11-2008 Session: FN

PART – A (10 x 2 = 20)

Answer All the Questions

1. What is specific weight and specific gravity of a fluid?

2. Write the relation between absolute pressure and gauge pressure.

3. Define continuity equation and what is the principle behind it.

4. List the types of flow mesureing devices fitted in a pipe flow, which uses the principle of Bernoulli's theorem.

5. Draw the hydraulic grade line and total energy line.

6. List the types of minor losses in flow through pipes.

7. What is positive displacement pump and rotodynamic pump?

8. Distinguish between pumps in series and pumps in parallel.

9. Write the function of draft tube in turbine outlet.

10. What are the types of similarities?

PART – B (5 x 12 = 60)

Answer ALL the Questions

11. A vertical cylinder of diameter 180mm rotates concentrically inside another cylinder of diameter 181.2mm. Both the cylinders are 300mm high. The space between the cylinders is filled with a liquid whose viscosity is unknown. Determine the viscosity of the fluid if a torque of 20Nm is required to rotate the inner cylinder at 120 rpm.

(or)

12. A U-tube manometer is used to measure the pressure of oil of specific gravity 0.85 flowing in a pipe line. Its left end is connected to the pipe and the right-limb is open to the atmosphere. The centre of the pipe is 100mm below the level of mercury (specific gravity = 13.6)in the right limb. If the difference of mercury level in the two limbs is 160mm, determine the absolute pressure of the oil in the pipe.

13. Derive from basic principle the Euler's equation of motion in cartesian co-ordinate system and deduce the equation to Bernoulli's theorem for steady irrotational flow.

(or)

14. A venturimeter is inclined at 60° to the vertical and its 150mm diameter throat is 1.2m form entrance along its length. It is fitted to a pipe of diameter 300mm. The pipe conveys gasoline of gravity 0.82 and flowing 0.215 m^3/s upwards. Pressure gauge inserted at entrance and throat show the pressure of 0.141 N/mm^2 and 0.077 N/mm^2 respectively. Determine the coefficient of discharge of the venturimeter.

15. A rectangular orifice 0.6m wide and 0.8m deep is discharging water from a vessel. The top edge of the orifice is 0.4m below the water surface in the vessel Find
(a) The discharge through the orifice if $C_d = 0.62$

(b) The percentage error if the orifice is treated as a small orifice.

(or)

16. A pipe line of 600mm diameter is 1.5 km long. To increase the discharge, another line of the same diameter is introduced parallel to the first in the second half of the length. If f = 0.01 and head at inlet is 300mm calculate the increase in discharge. Neglect minor losses.

17. The impeller of a centrifugal pump has an external diameter of 450mm and internal diameter of 200mm and it runs at 1440 rm. Assuming a constant radial flow through the impeller at 2.5 m/s and that the vanes at exit are set back at an angle of 25° determine
    (a) Inlet vane angle
    (b) The angle absolute velocity of water at exit makes with the tangent
    (c) The work done by water.

(or)

18. Draw the main components and explain the working of Reciprocating Pumps.

19. A single jet Pelton wheel runs at 300 rpm under a head of 510m. The jet diameter is 200 mm, its deflection inside the bucket is 165° and its relative velocity is reduced by 15% due to friction. Determine
    (a) Water power
    (b) Resultant force on the bucket
    (c) Overall efficiency

(or)

20. The discharge Q over a weir depends on the head of water h, acceleration due to gravity g, density ρ, viscosity μ and the surface tension σ. Obtain an expression for the discharge.