# SATHYABAMA UNIVERSITY
**(Established under section 3 of UGC Act, 1956)**

Course & Branch: B.E. – Mechanical / Mechanical & Production
Title of the paper: Fluid Mechanics and Machinery
Semester: III                                           Max. Marks: 80
Sub.Code: 15304/16304 (2004/2005)          Time: 3 Hours
Date: 20-04-2007                                      Session: AN

PART – A                    (10 x 2 = 20)
Answer ALL the Questions

1. Differentiate specific weight and specific volume.
2. Define 'Buoyancy'.
3. Distinguish between laminar and turbulent flow.
4. How are the weirs and notches classified?
5. What are hydraulic coefficients? Name them.
6. Major energy loss and minor energy losses in pipe – discuss.
7. Define the term 'cavitation'.
8. Define slip and negative slip of a reciprocating pump.
9. Draw the inlet and outlet velocity triangles of pelton wheel turbine and indicate the direction of various velocities.
10. What are the functions of draft tube in turbines?

PART – B                    (5 x 12 = 60)
Answer All the Questions

11. a. Define the terms i) Dynamic viscosity, and ii) Kinematic viscosity. Give their units.                    (4)
    b. One litre petrol weights 7N. Find the mass density, specific volume, specific volume, specific gravity and weight density of the petrol.                    (8)

(or)

12. a. What do you mean by meta-centre and meta-centric height.                    (4)

b. An inverted U-tube manometer is connected to two horizontal pipes A and B through which water is flowing. The vertical distance between the axes of these pipes is 30cm. When an oil of specific gravity 0.8 is used as a gauge fluid, the vertical heights of water columns in the two limbs of the inverted manometer (when measured from the respective center lines of the pipes ) are found to be same and equal to 35cm. Determine the difference of pressure between the pipes. (8)

13. State and prove Bernoulli's theorem from Euler's equation. Mention the assumptions made. How is it modified while applying in practice? List out its engineering application. (12)

(or)

14. a. What is pitot tube? State its applications. (4)
    b. The inlet and throat diameter of a horizontal venturimeter are 30cm and 10cm respectively. The liquid flowing through the meter is water. The pressure intensity at inlet is 13.734 $N/cm^2$ while the vacuum pressure head at the throat is 37 cm of mercury. Find the rate of flow. Assume that 4% of the differential head is lost between the inlet and throat. Find also the value of Cd for the venturimeter. (8)

15. a. Classify the orifice. (4)
    b. Derive the equation to find the discharge through fully sub-merged orifice. (8)

(or)

16. Derive Darcy-Weisback equation for determining the loss of head due to friction in pipes. (12)

17. a. What is priming? Why is it necessary? (4)
    b. Explain the following with formula i) Manometric efficiency ii) Mechanical efficiency iii) Overall efficiency of centrifugal pump. (8)

(or)

18. a. What is air vessel in reciprocating pump? State its functions. (4)

b. Explain with a neat sketch of double acting reciprocating pump with an air vessel fitted in the delivery side. (8)

19. a. Distinguish between Impulse and Reaction turbines. (4)

b. Explain the working principle of Pelton wheel turbine with a neat sketch by indicating all parts. (8)

(or)

20. A kalpan turbine working under a head of 20m develops 11772 kW shaft power. The outer diameter of the runner is 3.5m and hub diameter 1.75m. The guide blade angle at the extreme edge of the runner is 35°. The hydraulic and overall efficiencies of the turbines are 88% and 84% respectively. If the velocity of whirl is zero at outlet, determine:

i. Runner vane angles at inlet and outlet of the extreme edge of the runner, and

ii. Speed of the turbine.