

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Summer 2022 - 23 Examination**

**Semester: 4**  
**Subject Code: 203109263**  
**Subject Name: Fluid Mechanics and Machines**

**Date: 22/03/2023**  
**Time: 2:00pm to 4:30pm**  
**Total Marks: 60**

**Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions - ( Fill in the blanks, one word answer, MCQ-not more than Five in case of MCQ) (All are compulsory) (Each of one mark) (15)**

1. What is Newtonian Fluid?
2. Force exerted by jet striking at the center of fixed symmetric curved plate is given by  
 (a)  $F_x = \rho av^2$  (b)  $F_x = \rho av^2 (1 + \cos\theta)$  (c)  $F_x = \rho a(v - u)^2 (1 + \cos\theta)$  (d)  $F_x = \rho av^3$
3. Kinematic viscosity is the ratio of \_\_\_\_\_ to \_\_\_\_\_.
4. In Fluid Statics  $\frac{\partial P}{\partial Z} =$  \_\_\_\_\_
5. The maximum efficiency of transmission through a pipe is  
 (a) 50 % (b) 58.6 % (c) 66.67 % (d) 76.66 %
6. Orificemeter can be used to measure \_\_\_\_\_  
 (a) Cross-sectionally averaged velocity (b) Pressure (c) Volume Flow rate (d) a and c both
7. 1 Poise = \_\_\_\_\_ N\*sec/m<sup>2</sup>
8. If a person studies about a fluid which is at rest, what will you call his domain of study?
9. Dynamic viscosity has dimensions as  
 (a) MLT<sup>-2</sup> (b) ML<sup>-1</sup>T<sup>-1</sup> (c) ML<sup>-1</sup>T<sup>-2</sup> (d) M<sup>-1</sup>L<sup>-1</sup>T<sup>-1</sup>
10. Which of the following is not a Reaction turbine?  
 (a) Pelton turbine (b) Francis turbine (c) Kaplan turbine (d) Propeller turbine
11. Degree of reaction turbine is the ratio of \_\_\_\_\_
12. The flowrate through open Canal is measured by\_\_\_\_\_.  
 (a) Rectangular notch (b) Venturimeter (c) pitot-tube (d) U-tube manometer
13. Impact of jet Works on \_\_\_\_\_ principal.
14. In impulse Turbine, energy available at the inlet is in the form of \_\_\_\_\_ Energy
15. 1 atm pressure is equivalent to \_\_\_\_\_.  
 (a) 670 mm of Hg (b) 10.3 m of water column (c) 10132.5 Pa (d) 620 mm Hg

**Q.2 Answer the following questions. (Attempt any three) (15)**

- A) Explain major and minor losses in a pipe flow
- B) Explain construction and working of Piezometers. Also states its limitations.
- C) The velocity distribution for flow over a flat plate is given by  $u = 3/4 y - y^2$  in which u is the velocity in meter per second at a distance y meter above the plate. Determine the shear stress at y=0.15 m. Take dynamic viscosity of fluid as 8.6 poise.

D) Briefly discuss Eulerian and Lagrangian approach for description of fluid flow

**Q.3** A) An oil of sp. gr. 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take  $C_d = 0.98$ . (07)

B) Discuss characteristic curves of Hydraulic turbines with neat sketch. (08)

**OR**

B) Derive Bernoulli's equation stating all assumptions. (08)

**Q.4** A) An outward flow reaction turbine has internal and external diameters of the runner as 0.6 m and 1.2 m respectively. The guide blade angle is  $15^\circ$  and velocity of flow through the runner is constant and equal to 4 m/s. If the speed of the turbine is 200 r.p.m., head on the turbine is 10 m and discharge at outlet is radial, determine: (07)

(i) The runner vane angles at inlet and outlet,

(ii) Work done by the water on the runner per second per unit weight of water striking per second,

(3) Hydraulic efficiency

(4) The degree of reaction

**OR**

A) Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet with neat sketch. (07)

B) Give classification of pumps. Explain construction and working of Centrifugal Pump (08)