



**PRESIDENCY UNIVERSITY,
BENGALURU**

SCHOOL OF ENGINEERING

MAKEUP EXAMINATION- JAN 2023

Course Code: MEC 203

Course Name: Fluid mechanics and Machines

Program : B.Tech - MECH

Date: 23-Jan-2023

Time: 9.30 AM to 12.30 PM

Max Marks: 80

Weightage: 40%

Instructions:

- (i) Read the question properly and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and Non-programmable calculators are permitted.

Part A

Answer all the Questions. Each question carries FIVE marks.

(4Qx5M=20)

1. A pipe of diameter 30 cm carries water at a velocity of 20 m/sec. The pressures at the points A and B are given as 34.335 N/cm^2 and 29.43 N/cm^2 respectively, while the datum head at A and B are 25 m and 28 m. Find the loss of head between A and B.
2. Which device is used for measuring velocity in a pipe flow? Explain the working principle of the same with a neat sketch.
3. Write the importance of Dimensional analysis technique. Explain the similarities between model and prototype.
4. Determine the dimensions of the following quantities in LMT method. (a) Angular acceleration (b) Dynamic viscosity and (c) Kinematic viscosity.

Part B

Answer all the Questions.

(15+15+10M=40)

5. Derive the expression for rate of flow through orifice meter.
6. (a) Derive the expression for Drag and Lift.
(b) A flat plate 2 m x 2m moves at 40km/hour in stationary air of density 1.25kg/m^3 . If the coefficient of drag and lift are 0.2 and 0.8 respectively, find the Drag force, Lift force and power required to keep the plate in motion.
7. Find the discharge of oil of specific gravity 0.8 flowing through a pipe of 40 cm diameter placed in an inclined position where a venturimeter is inserted, having a throat diameter of 15 cm. The difference of pressure between the main and throat is measured by a liquid of 0.6 in an inverted U-tube which gives a reading of 30 cm. The loss of head between the main and throat is 0.3 times the kinetic head of the pipe.

Part C

Answer all the Questions. Each question carries TEN marks.

(1Qx20M=20)

8. Using Buckingham's Pi – method, show that the discharge Q consumed by an oil ring is given by

$$Q = Nd^3 \phi \left[\frac{\mu}{\rho Nd^2}, \frac{\sigma}{\rho N^2 d^3}, \frac{w}{\rho N^2 d} \right]$$

In the above the following parameters are considered.

Diameter, rotational speed, density, viscosity, surface tension and specific weight of oil.