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**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF ENGINEERING

SUMMER TERM / MAKE UP END TERM EXAMINATION

Semester: Summer Term 2019

Date: 26 July 2019

Course Code: MEC 203

Time: 2 Hours

Course Name: Fluid Mechanics and Machines

Max Marks: 80

Program & Sem: B.Tech & IV Sem (2016 & 2017 Batch)

Weightage: 40%

Instructions:

- (i) **Non-programmable calculators are permitted.**
- (ii) **Use Pencil to draw the sketch.**
- (iii) **Think and write optimal answer to the given question.**

Part A

Answer **any four** Questions. **Each** question carries **five** marks. (4Qx5M=20M)

1. Explain the methods of describing the fluid motion and list the types of fluid flow motion.
2. Write the importance of Dimensional analysis technique. Explain the similarities between model and prototype.
3. Determine the dimensions of the following quantities in LMT method. (a) Angular acceleration (b) Dynamic viscosity and (c) Kinematic viscosity.
4. Brief the working principle and purpose of Venturimeter, orifice meter and Pitot tube.
5. A pipe through which water is flowing is having diameters 10cm and 30cm at the cross section 1 and 2 respectively. The velocity of water at section 1 is 5 m/s. Find the velocity head at section 1 and section 2 and also rate of discharge.

Part B

Answer **the** Questions. **Each** question carries **ten** marks. (3Qx10M=30M)

6. A conical tube of length 16 m is fixed vertically with its smaller end upwards. The water is flowing from smaller end to larger end. The diameter of pipe at input and output are 5m and 12m respectively. The pressure head at smaller end of pipe is 5m of liquid. The loss of head in the tube is $\frac{3.5(v_1-v_2)}{2g}$ where v_1 and v_2 are respective velocities. Determine the pressure at larger end.
7. Derive the continuity equation in three dimension. Represent the same for steady flow, incompressible flow and two-dimension flow.

8. The velocity vector in a fluid flow is given by $\mathbf{V}=5x^4\mathbf{i} - 10x^3y\mathbf{j} + 20t\mathbf{k}$. Find the velocity and acceleration of the fluid particle at (2,1,1) at time $t=3$.

Part C

Answer **both** the Questions.

(7+8+10+5=30M)

9. (a) A cylindrical block of wood of specific gravity 0.8 needs to float in water. Determine the necessary things if the block has to float if its size is 4m diameter and 3m height.

(b) The following are the parameters considered for drag and lift test of an object.

- I. 5 m^2
- II. 2.36 kg/m^3
- III. $C_L = 2.5$
- IV. $C_f = 1.3$
- V. 5 m/s

Determine the necessary parameters required to conclude the test.

10. (a) Find an expression for the drag force on a smooth sphere of diameter D , moving with uniform velocity V , in a fluid of density ρ and dynamic viscosity μ by using Rayleigh method.

(b) Find the expression for the power P , developed by a pump when P depends upon the head H , discharge Q and specific weight w of the fluid by Rayleigh method.