B. Tech 3rd Semester, G-Scheme

(Mechanical and Automation)

Examination, December-2023

MACHANICS OF FLUID

Paper–PCC-MA-211-G

Time allowed : 3 hours]   [Maximum marks : 75

Note : Question 1st is compulsory. Attempt total **five** questions selecting **one** question from each Section. All questions carry equal marks.

1. Explain following terms :   6×2.5
   (a) What do you understand by laminar flow.
   (b) Sketch the velocity distribution across a section of pipe.
   (c) Explain Hydraulic gradient line and Total Energy line
   (d) Describe various types of fluid flow
   (e) Define Mach no.
   (f) What is Capillary rise or fall?

Section-A

2. Determine the total pressure on a circular plate of diameter 1.5m which is placed vertically in water in such a way that the centre of pressure of plate is 3m below the free surface of water. Find the position of centre of pressure also.   15

3. The velocity vector in an incompressible flow is given by :   15
$$V = (6xt + yz^2) i + (3t + xy^2) j + (xy - xyz - 6tz) k$$
   (i) Verify whether the continuity equation is satisfied
   (ii) Determine the acceleration vector at point, A (1, 1, 1) at t = 1.0   15

3162-P-2-Q-9-(23)

[P.T.O.

Section-B

4. What is Euler's equation of motion? How will you obtain Bernoulli's equation from it. 15

5. A 45° reducing bend is connected in the pipe-line the diameter at the inlet and outlet of the bend being 40 cm and 20 cm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of bend is $21.58 N/cm^2$. The rate of flow of water is 500Lit/sec. 15

Section-C

6. State Buckingham's π-theorem and explain its procedure for solving problem with the help of example. 15

7. Draw a neat sketch of Reynolds Apparatus and explain how the laminar flow can be demonstrated with the help of the apparatus. 15

Section-D

8. Explain the concept of velocity distribution for turbulent flow in smooth and rough pipes. 15

9. Water at 30° and atmospheric pressure flows through a smooth pipe of 5cm I.D. the flow is fully developed and is at the rate of 2 litre/s. find out- 15

   (i) Friction factor
   (ii) Pressure drop over a length of 5 m
   (iii) Thickness of laminar sub layer.