53 (CE 303) FLMC

2018

FLUID MECHANICS

Paper : CE 303

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions.*

1. The velocity vector in a fluid flow is given by $V = 4x^3\hat{i} - 10x^2y\hat{j} + 2t\hat{k}$.

   Find the velocity and acceleration at (2, 2, 3) at time = 2 units. 20

2. Using Buckingham's π theorem express the 'V', velocity through circular orifice in terms of dimensionless parameters. 'V' depends upon Head 'H' causing the flow, 'D' diameter of the orifice, 'μ' coefficient of viscosity, 'ρ' density of the fluid and 'g' acceleration due to gravity. 20

3. Write short notes on : 4×5=20

(a) Streamlines, Pathlines and Streaklines

(b) Velocity Potential and Stream Function

(c) Buckingham's π theorem

(d) Classification of types of flow.

4. (a) Derive the Darcy-Weisbach equation for pipe flow.

(b) Derive Bernoulli's Equation.

2×10=20

5. (a) Classify notches and weirs. Derive equation for maximum discharge for broad-crested weir.

$C_d = 0{\cdot}3849$

(b) Derive discharge equation for venturimeter and orifice meter.

2×10=20

6. The water is flowing through a pipe of length $100m$ having diameter of $600mm$ at the upper end and $300mm$ at the lower end, if the pressure at the higher end is $19{\cdot}62 N/cm^2$, find the pressure at the lower end, if discharge is $50 l/s$. The pipe has a slope of 1 in 30. 20