53 (CE 303) FLMC

2017

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. State Buckingham's π-theorem. If the efficiency 'η' of a fan depends on density 'ρ', dynamic viscosity 'μ' of the fluid, angular velocity 'ω', diameter D of the rotor and the discharge 'Q'. Express 'η' in terms of dimensionless parameters. 20

2. *(a)* Derive Bernoulli's Equation. 10

   (b) Derive discharge equation for venturimeter and orificemeter. 10

Contd.

3. Write short notes on : 4×5=20

(a) Types of fluid

(b) Broad crested weir

(c) Types of fluid flow

(d) Siphon.

4. At a sudden enbragment of a water main from 240*mm* to 480*mm* diameter, the hydraulic gradient line rises by 10*mm*. Estimate the rate of flow. 20

5. A fluid flow field is given by

$$v = x^2 y\hat{i} + y^2 z\hat{j} - \left(2xyz + yz^2\right)\hat{k}$$

Prove that it is a case of steady incompressible fluid flow. Calculate the velocity and acceleration at point (2, 1, 3). 20

6. Explain the different types of pressure measurement devices with figures. 10

(b) Calculate the dynamic viscosity of an oil, which is used for lubrication between a square plate of size $0{\cdot}8m \times 0{\cdot}8m$ and an inclined plane at 30°. The weight of the square plate is $300N$ and it is sliding down the inclined plane with a velocity of $0{\cdot}3m/s$. The thickness of oil film is $1{\cdot}5mm$.

10