53 (CE 303) FLMC

2014

FLUID MECHANICS

Paper : CE 303

Full Marks : 100

Pass Marks : 30

Time : Three hours

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

*Answer **any five** questions from seven.*

1. *(a)* Define viscosity. Explain the variation of viscosity with temperature. 6

   (b) A plate, 0·025*mm* distant from a fixed plate, moves at 60 *cm/s* and requires a force of 2*N* per unit area i.e. $2N/m^2$ to maintain this speed. Determine the fluid viscosity between the plates. 14

2. *(a)* Mention Bernoulli's equation with assumption. 6

(b) The water is flowing through a pipe having diameters 25*cm* and 15 *cm* at sections 1 and 2 respectively. The rate of flow through pipe is 40 *litres/second.* The section 1 is 5*m* above the datum and section 2 is 3*m* above datum. If the pressure at section 1 is 39·42 N/cm^2, find the pressure at section 2. 14

3. (a) Define Pascal's law. 4

(b) The diameter of a small piston and a large piston of a hydraulic jack are 3*cm* and 10*cm* respectively. A force of 70*N* is applied on the small piston. Find the load lifted by the large piston when :

(i) the pistons are at the same level.

(ii) small piston is 40*cm* above the large piston. Given density of liquid in the jack as 1000 kg/m^3. 16

4. How can one measure fluid pressure ? Give a detailed explanation of manometer and its types. 20

5. Water flows through a pipe AB $1 \cdot 5m$ diameter at $3m/s$ and then passes through a pipe BC $1 \cdot 8m$ diameter. At C, the pipe branches, Branch CD is $0 \cdot 8m$ in diameter and carries one-fourth of the flow in AB. The flow velocity in branch CE is $2 \cdot 5$ m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE. 20

6. Define and explain : 20

   (a) Continuity equation

   (b) Bernoulli's equation

   (c) Venturimeter and its application

   (d) Head losses for flow in pipes.

7. What is understood by head losses in pipe flow ? Discuss the minor head losses in detail. 20
