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53 (FPT 303) FLMC

2021

# FLUID MECHANICS

Paper : FPT 303

Full Marks : 100

Time : Three hours

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

Answer **any five** questions.

1. (a) Define :                                    2×5

    (i) Specific weight

    (ii) Specific volume

    (iii) Pitot tube

    (iv) Drag force

    (v) Discharge.

  (b) State Hydrostatic law and derive the
equation.                                    2+8

2. (a) State Continuity Equation. Prove that for incompressible fluid,

$A_1 V_1 = A_2 V_2$ where

$A_1$, $A_2$ = Cross-sectional area of pipe

$V_1$, $V_2$ = Average velocity of fluid across the section. 2+8

(b) State and derive Euler's Equation of motion. 2+8

3. (a) Calculate the pressure due to a column of $0.7 m$ of

(i) water

(ii) an oil of specific gravity 0.8

(iii) mercury of specific gravity 13.6.

(Take density of water, $\rho = 100 kg/m^3$

3+3+4

(b) A pipe, through which water is flowing, is having diameters, $25 cm$ and $15 cm$ at the cross-sections 1 and 2 respectively. The velocity of water at section 1 is $20 m/s$. Find the velocity at section 2 and also rate of discharge. 5+5

4. (a) What is Reynolds number? Discuss Reynolds Experiment with a neat diagram. 3+7

(b) Derive the Darcy Equation for loss of head due to friction in pipes. 10

5. (a) What are the different types of loss of energy in pipes? Explain. 8

(b) Derive the equations for drag and lift. 6+6

6. (a) Distinguish between Centrifugal pump and Reciprocating pump. 5

(b) What is Orifice? Derive the mathematical expression of Torricelli's theorem. 2+6

(c) An orifice $55 mm$ in diameter is discharging water under a head of $10 m$. If $C_d = 0.6$ and $C_v = 0.9$, find —

(i) Actual discharge

(ii) Actual velocity of jet at vena contracta. $3.5 \times 2 = 7$

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