

9. (a) State Buckingham's π -theorem. Write procedure for solving problems by Buckingham's π -theorem. 10
- (b) Explain in detail geometric and dynamic similarity. 5

Roll No. _____

3028

**B. Tech. (Civil Engg.) 3rd Semester
Examination – February, 2022**

FLUID MECHANICS

Paper : FCC-CE-205G

Time : Three hours]

[Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after examination.

Note : Question No. 1 is compulsory. Attempt five questions in all, taking one question from each Section. All question carry equal marks. Assume missing data, if any, suitably.

1. Describe the following :

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- (a) Surface tension and capillarity
- (b) Pressure gauge
- (c) Pascal's law
- (d) Rotational and irrotational flow
- (e) Geometric and dynamic similarity
- (f) Laminar and turbulent flow

SECTION - A

2. (a) Find the height through which the water will rise by capillary action in a glass tube of 2 mm diameter, if the surface tension is 0.075 N/cm. 7
- (b) If a 4 m³ of oil weighs 40 kN, calculate the specific weight, mass density and specific gravity of the oil. 8
3. (a) Describe Newton's law of viscosity. 5
- (b) A rectangular plate 1.2 m × 0.4 m, weighing 970 N slides down a 45° inclined surface at a uniform velocity of 2.25 m/s. If the 2 mm gap between the plate and the inclined surface is filled with oil, determine its dynamic viscosity. 10

SECTION - B

4. (a) Calculate the gauge pressure and absolute pressure at a point 4 m below the free surface of liquid which has a density of 1.53×10^3 kg/cm³. The atmospheric pressure is 75 cm of mercury. Assume specific gravity of mercury 13.6 and water density 1000 kg/m³. 7
- (b) What is piezometer? Describe different types of manometers with neat diagram. 8
5. (a) What do you mean by buoyancy? Explain briefly the stability of immersed and floating bodies? 7

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- (b) Describe the following:
- (i) Centre of pressure
- (ii) Metacentric height

SECTION - C

6. (a) Stream function is given by $\psi = 5x - 6y$. Calculate the velocity components and also magnitude and directions of resultant velocity at any point. 7
- (b) Describe limitations and practical applications of Bernoulli's equation. 8
7. (a) What is continuity equation? Derive an expression for two-dimensional continuity equation. 10
- (b) Describe the following:
- (i) Stream line and streak line
- (ii) Ideal and real fluid flow

SECTION - D

8. (a) Explain the phenomenon of laminar boundary layer and turbulent layer. 7
- (b) Define and derive the expression for boundary layer thickness and energy thickness. 8

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