

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**PDDC - SEMESTER-III EXAMINATION – SUMMER 2016**

**Subject Code: X31901****Date: 26/05/2016****Subject Name: Fluid Mechanics****Time: 02:30 PM to 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Define following terms, **07**
- |                        |                      |
|------------------------|----------------------|
| (i) Density            | (ii) Specific Weight |
| (iii) Specific Gravity | (iv) Specific Volume |
| (v) Viscosity          | (vi) Surface Tension |
| (vii) Vapour pressure. |                      |
- (b)** Explain the effect of temperature on the viscosity of liquids and gases. **07**
- Q.2 (a)** State Pascal's law and prove it. **07**
- (b)** A U tube manometer connecting two pressure pipes at A and B. the pipe A contains a liquid of specific gravity 1.5 under a pressure of 100 kN/m<sup>2</sup>. The pipe B contains oil of specific gravity 0.8 under pressure of 175 kN/ m<sup>2</sup>. the point A is 3 m above the point B. the height of liquid in left limb 4m below point A. calculate the difference in mercury level in the differential manometer. **07**
- OR**
- (b)** Describe the phenomenon of capillary and derive an expression for capillary rise of a liquid. **07**
- Q.3 (a)** Explain with neat sketches the conditions for equilibrium for floating and submerged bodies. **07**
- (b)** A rectangular plane surface 2 m wide and 3 m high immersed in water, it's plane is making an angle 45° with the free surface of water. The upper edge of rectangular plate is 1.5 m below free surface. Calculate: (i) Total pressure on plate and (ii) Position of centre of pressure. **07**
- OR**
- Q.3 (a)** Explain laboratory method for determining metacentric height of a floating body and give experimental formula for the same. **07**
- (b)** A circular lamina 125 cm in diameter is immersed in water so that the distance of its edge measured vertically below the free surface varies 60 cm to 150 cm. find the total force due to water on one side of the lamina and vertical distance of the center of pressure below the water surface. **07**
- Q.4 (a)** Distinguish between **07**
- |                                    |  |
|------------------------------------|--|
| (i) Steady and unsteady flow,      |  |
| (ii) Uniform and non-uniform flow, |  |
| (iii) Laminar and turbulent flow   |  |
- (b)** The velocity vector in a flow field is given by  $V = 3x^3 i - 2x^2 yj$ . Determine the velocity, local acceleration, and convective acceleration of a fluid particle in the field at point (1,3,2). Is this flow steady or unsteady? It is two or three dimensional? **07**

**OR**

- Q.4 (a)** Explain rotational and irrotational flow in detail. **07**

- (b) Explain flow net and state the importance of flow net. **07**
- Q.5** (a) State and explain Buckingham's  $\pi$  – theorem. **07**
- (b) With a neat sketch discuss Reynold's experiment and observations made by him. **07**
- OR**
- Q.5** (a) Derive Darcy Weisbach equation for the co-efficient of friction in pipe. **07**
- (b) Prove that velocity of sound wave in a compressible fluid is given by  $C=\sqrt{\gamma RT}$  **07**

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