<div align="center">

(Three Hours)   **80 Marks**

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N.B.:

1. **Q.1** is **compulsory**
2. Attempt any **three** question out of remaining **five**
3. Assume **suitable** data if **required**

1. Attempt any four from following

a) Define mass density, weight density, specific gravity, specific volume and viscosity.   **5**

b) Explain stability of submerged bodies   **5**

c) Differentiate between notches and weirs   **5**

d) Explain equipotential lines and flow net   **5**

e) Explain surface tension and capillarity   **5**

f) What are different types of pressure measuring devices   **5**

2. a) A vertical gap 23.5 mm wide of infinite extent contains oil of specific gravity 0.95 and viscosity of 2.45 N-s/m^2. A metal plate 1.5 m x 1.5 m x 1.5 mm thickness weighing 49 N is to be lifted through the gap at a constant speed of 0.1 m/s. Estimate the force required   **10**

b) A tank contains water upto a height of 0.5 m above the base. An immiscible liquid of sp. Gravity 0.8 is filled on the top of water upto 1m height. Calculate (i) total pressure on one side of tank (ii) the position of centre of pressure for one side of the tank which is 2m wide **10**

3.a) If for a two dimensional flow, the velocity potential is given by $\varphi = 4x$ (3y-4), determine the velocity at the point (2,3). Determine also the value of stream function ψ at the point (2,3)
                                                                                              10

b) Show that for a vessel containing liquid subjected to constant rotation, the rise of liquid level at the wall is equal to the fall of liquid level at the axis of rotation.   **10**

4.a) A solid cube of sides 0.5 m each is made of a material of specific gravity 0.5. The cube floats in a liquid of specific gravity 0.95 with two of its faces horizontal. Estimate its stability

                                                                                              10

b) Derive expression for discharge through a rectangular notch also, find the discharge of water flowing over a rectangular notch of 2 m length when the constant head over the notch is 280mm. Take Cd = 0.60 **10**

5. a) A pipe line carrying oil of sp.gr. 0.87, changes in diameter from 200mm diameter at position A to 500mm diameter at position B which 4m at a higher level. If the pressures at A and B are $9.81N/cm^2$ to $5.9N/cm^2$ respectively and the discharge is 200 lit/sec. Determine the loss of head and direction of flow **10**

b) Derive Bernoulli's equation of motion also states assumptions made with its

 applications. **10**

6. Write short note on

a) Experimental method for determination of metacentric height **5**

b) Source, Sink and Doublet **5**

c) Flow past a Rankine oval body **5**

d) Cipolletti weir **5**

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