

N.B. (1) Question No.1 is compulsory.

(2) Attempt any **three** questions out of remaining **five** questions.

(3) **Assume** suitable **data** wherever **required**.

(4) **Assumptions** made should be stated **clearly**.

1. (a) Define surface tension and capillarity. Give practical examples of each. 5
- (b) Explain major and minor losses in pipes. 5
- (c) Draw ISO symbols for : (i) Pressure intensifier. 5
- (ii) Pressure switch.
- (iii) Five way two position directional control valve.
- (iv) Bidirectional variable displacement pump.
- (v) Double acting cylinder with variable cushion at both ends.
- (d) Explain with neat sketch, the operation of sequence valve. 5
2. (a) A vertical gap 2.2cm wide of infinite extent contains a fluid of viscosity 2 N-s/m^2 and specific gravity 0.9. A metallic plate $1.2\text{m} \times 1.2\text{m} \times 0.2\text{cm}$ is to be lifted with a constant velocity of 0.15 m/s , through the gap. If the plate is in the middle of the gap, find the force required. The weight of the plate is 50N . 12
- (b) Differentiate with example. 8
- (i) Laminar flow and turbulent flow. (ii) Rotational flow and irrotational flow.
3. (a) A $250\text{mm} \times 150\text{mm}$ venturimeter is provided in vertical pipeline carrying oil of specific gravity 0.88, flowing upward. The difference in elevation of throat and entrance section of venturimeter is 250mm . The differential U-tube manometer shows a gauge deflection of 200mm . Calculate (i) Discharge of oil (ii) Pressure difference between entrance section and throat section. Take C_d as 0.98 and specific gravity of mercury as 13.6. 10
- (b) A triangular plate of 1m base and 1.5m altitude is immersed in water. The plane of plate is inclined at 30° with free water surface and the base is parallel to and at a depth of 2m from water surface. Find total pressure on the plate and the position of centre of pressure. 10
4. (a) Two pipes of diameter 400mm and 200mm are each 300mm long. When the pipes are connected in series the discharge through the pipeline is $0.10\text{m}^3/\text{s}$, find the loss of head incurred. What would be the loss of head in the system to pass the same total discharge when the pipes are connected in parallel? Take friction factor = 0.0075 for each pipe. 10
- (b) Explain with neat sketch the operation of unbalanced vane pump. Draw the performance characteristics of the pump and explain. 10

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5. (a) A fluid of viscosity 8 poise and specific gravity 1.2 is flowing through a circular pipe of diameter 100mm. The maximum shear stress at the pipe wall is 210 N/m^2 . Find
- (i) The pressure gradient.
 - (ii) The average velocity
 - (iii) Reynolds number of flow.
- (b) (i) Enumerate relative merits and demerits of hydraulic & pneumatic systems. 10
- (ii) Explain with neat sketch Bleed off circuit.
6. (a) (i) Explain with neat sketch pressure relief valve. 10
- (ii) Enlist desirable properties of hydraulic fluid.
- (b) Explain regenerative circuit with neat sketch. Derive the relationship between extend and retract speeds and thrusts in terms of piston area and rod area and prove that they are equal for 2: 1 cylinder. 10