17411

14115

3 Hours / 100 Marks   Seat No. ☐☐☐☐☐☐☐☐

Instructions : (1) All Questions are *compulsory*.

(2) Illustrate your answers with neat sketches wherever necessary.

(3) Figures to the right indicate full marks.

(4) Assume suitable data, if necessary.

(5) Use of Non-Programmable Electronic Pocket Calculator is permissible.

(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **(A)** **Answer any SIX of the following :**   **6 × 2 = 12**

(a) Define cohesion and adhesion with one example of each.

(b) Why mercury is used in manometer ?

(c) State continuity theorem.

(d) Write the formula for force exerted by a jet on the curved plate, when jet strikes the plate at the centre.

(e) Define steady & un-steady flow with one example of each.

(f) Define slip & negative slip.

(g) List any four commonly used draft tubes.

(h) Define NPSH for centrifugal pump.

(B) **Attempt any TWO of the following :**   **2 × 4 = 08**

(a) Define : (i) absolute (ii) gauge (iii) vacuum and (iv) atmospheric pressure.

(b) Explain inverted U-tube differential manometer.

(c) Write any four laws of fluid friction for turbulent flow.

2. **Attempt any FOUR of the following :** **4 × 4 = 16**

   (a) Write any four advantages of mechanical gauges over manometer.

   (b) Define hydraulic coefficients & write the general value of each.

   (c) A jet of water 10 cm diameter strikes on a flat plate with a velocity of 18 m/s. The plate is moving with a velocity of 9 m/s in the direction of jet and away from the jet. Find the efficiency of the jet.

   (d) Calculate the discharge through a pipe of diameter 200 mm when the difference of pressure head between the two ends of pipe 500 m apart is 4 m of water. Take f = 0.009

   (e) Explain the HGL and TEL with neat sketch.

   (f) An open tank contains water upto a depth of 2 m and above it an oil of specific gravity 0.8 for a depth of 1 m. Find the pressure at the bottom of the tank.

3. **Attempt any FOUR of the following :** **4 × 4 = 16**

   (a) Compare impulse turbine with reaction turbine (minimum eight points).

   (b) Classify hydraulic turbines with examples.

   (c) Draw inlet & outlet velocity triangles for Francis Turbine & give the name of each term used.

   (d) A horizontal jet of water is delivered under an effective head of 25 m. Calculate the diameter of jet if the force exerted by the jet on a vertical fixed plate is 2.22 kN. Take coefficient of velocity as 0.99.

   (e) A circular plate of 6 m diameter is held in water in such a way that its maximum & minimum depth from surface of water is 3 m & 9 m. Determine the total pressure on the plate & the position of centre of pressure.

   (f) Determine the surface tension of liquid in contact with air and a glass tube. If the capillary tube diameter 2 mm is dipped in a liquid of specific gravity 0.8, the liquid rises in the tube by 15 mm, making an angle of contact of 25° with the tube.

4. **Attempt any TWO of the following :** **2 × 8 = 16**

   (a) Explain the working of Kaplan turbine.

   (b) Explain the working of jet pump.

   (c) A Centrifugal pump is to discharge water at the rate of 110 lits/sec at the speed of 1450 rpm against head of 13 m. Impeller diameter is 250 mm & its width is 50 mm. If manometric efficiency is 75%, determine vane angle at outer periphery.

5. **Attempt any FOUR of the following :** 4 × 4 = 16

   (a) A 30 cm pipe carrying water, branches into two pipes of 20 cm and 15 cm diameter. If mean velocity in 30 cm pipe is 2.5 m/s, find the discharge in the pipe. Also find velocity in 15 cm pipe if the mean velocity in 20 cm pipe is 2 m/s.

   (b) A pipe of diameter 25 cm is suddenly enlarged to diameter of 50 cm. If pipe carries 350 lits/sec, find the loss of head due to expansion.

   (c) Write two effects & two remedial measures for water hammer.

   (d) Explain the working of self priming device.

   (e) Define the following for centrifugal pump :

      (i) Static head

      (ii) Manometric head

      (iii) Mechanical efficiency

      (iv) Manometric efficiency

   (f) Explain ideal indicator diagram of reciprocating pump.

6. **Attempt any TWO of the following :** 2 × 8 = 16

   (a) Explain the working of double acting reciprocating pump.

   (b) A pipe 5 m long is inclined at 15º with horizontal. The smaller section of the pipe is in 80 mm diameter & at lower level whereas other section is 240 mm diameter. Determine the difference of pressure between two sections. Pipe is uniformly tapering & the velocity of water at smaller section is 1 m/s. Also show the direction of flow of water.

   (c) (i) A jet of water 50 mm diameter, moving with a velocity of 15 m/s impinges on a series of vanes moving with a velocity of 6 m/s. Find efficiency of the jet.

      (ii) Explain the function of spear and breaking jet in pelton turbine.

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