21718

3 Hours / 100 Marks   Seat No.

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

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

(3)   Assume suitable data, if necessary.

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

Marks

1.   **(A)   Attempt any SIX of the following :**   **12**

(a)   Define surface tension and state its unit.

(b)   A pressure of 1.2 Pascal applied to 650 litres of a liquid caused a volume reduction by 1.5 litres respectively. Calculate the bulk modulus of elasticity for liquid.

(c)   What is the principle of Manometer ?

(d)   Convert pressure head of 50 m of oil of sp. gravity 0.8 into corresponding head of water.

(e)   Write modified Darcy's Weisbach equation.

(f)   Define hydraulic gradient line and total energy line.

(g)   Enlist any four velocity measuring devices for canal.

(h)   Write the principle on which venturimeter works.

    (B) **Attempt any TWO of the following :** **8**

        (a)   If specific gravity of oil is 0.80. What is the specific weight in N/m^3 ?

        (b)   A shaft of 150 mm diameter rotates at 75 rpm in a 500 mm long bearing taking that two surfaces are uniformly separated by a distance of 1 mm and considering linear velocity distribution having viscosity of 0.005 $N.s/m^2$. Find the power absorbed in bearing.

        (c)   State Pascals' law of fluid pressure. Enlist any four applications of it.

2. **Attempt any FOUR of the following :** **16**

    (a)   A circular plate of 4 m diameter is immersed in water such that its greatest and least depth below the free surface of water are 5 m & 3 m respectively, calculate (i) Total pressure on one face of plate (ii) The position of centre of pressure.

    (b)   Find the intensity of pressure in N/m^2 on the base of container when (i) Water stands to a height of 1.25 m in it. (ii) When oil for 0.625 m height stands on water of 1 m height. Draw pressure diagrams in all cases.

    (c)   Explain the concept of pressure diagram with neat sketches and explain the use of pressure diagram.

    (d)   An oil of specific gravity 0.8 is flowing through a pipe. A simple manometer is connected to the pipe containing mercury. The deflection of mercury level in left limb from centre of pipe is 60 mm, whereas in right limb (from centre of pipe) it is 90 mm. Calculate the pressure in KPa.

    (e)   Define : (i) Reynolds number (ii) Pressure head (iii) Velocity head (iv) Datum head.

    (f)   State Bernoulli's theorem. State any two applications of it.

3. **Attempt any FOUR of the following :** 16

   (a) A pipe line carrying oil of specific gravity 0.8 changes in diameter from 300 mm at position 1 to 600 mm diameter at position 2 which is at 5 M at a higher level. If the pressure at position 1 & 2 are 100 kN/m^2 & 60 kN/m^2 respectively and the discharge is 300 lit/sec. Determine the loss of head.

   (b) A pipe line changes in size from 30 cm diameter at A to 60 cm at B. It is used to carry oil of specific gravity 0.80. Point A is 5 m lower than point B and the pressure are 80 kN/m^2 & 60 kN/m^2 respectively. If the discharge is 200 LPS. Find the loss of head and direction of flow.

   (c) What are major and minor loss of head in flow through pipes ? Write any two equations of minor loss.

   (d) An oil of specific gravity 0.9 & viscosity of 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 litres / sec. Find the head lost due to friction for 500 m length of pipe. take f = 0.02.

   (e) What do you mean by water hammer ? State its causes (any three).

   (f) Define with a neat sketch for a trapezoidal channel (1) Hydraulic depth (2) Hydraulic Radius.

4. **Attempt any FOUR of the following :** 16

   (a) Define steady, unsteady, uniform & non-uniform flow in open channel.

   (b) What is meant by most economical channel section and write condition for most economical rectangular & trapezoidal channel section.

   (c) What do you mean by Hydraulic jump ? Explain with sketch.

   (d) Water flows through a rectangular open channel having width of 2 m with flow depth of 0.6 m with discharge of 4 m^3/sec. Find Fraud's number.

   (e) Define hydraulic coefficients. State the relationship among the hydraulic coefficients for an orifice.

   (f) A 30 × 15 cm venturimeter is provided in a vertical pipe line carrying oil of specific gravity 0.90 the flow being upward. The difference in elevations of the throat section and entrance section of the venturimeter is 50 cm. The differential U-tube mercury manometer shows a gauge deflection of 30 cm. Calculate discharge of oil. (cd = 0.98)

5. **Attempt any FOUR of the following :** 16

   (a) Draw a neat sketch of cup type current meter and explain its working.

   (b) Determine the discharge through 60° triangular notch in lit/sec. when the head is 0.20 m. take cd = 0.6.

   (c) A rectangular notch 2.5 m wide has a constant head of 40 cm. Find discharge over it if cd = 0.62.

   (d) Define (i) Static head (ii) Manometric head of pump.

   (e) Differentiate between centrifugal and reciprocating pump.

   (f) A centrifugal pump delivers water at 30 lit/sec. to a height of 18 m through a pipe of 90 m long & 100 mm in diameter if overall efficiency of pump is 75%. Find power required to drive the pump take f = 0.012.

6. **Attempt any TWO of the following :** 16

   (a) Explain with a neat sketch the working of Bourdon's pressure gauge.

   (b) A Siphon of diameter 20 cm connects two reservoirs having a difference in elevation of 20 m. The length of the Siphon is 500 m & the summit is 3 m above the water level in the upper reservoir. The length of the pipe from upper reservoir to the summit is 100 m. Determine the discharge through the Siphon and also pressure at summit. Neglect minor losses. Take coefficient of friction f = 0.005.

   (c) A trapezoidal channel of most economical section has side slope 1.5 horizontal to 1 vertical. It is required to discharge 16 m^3/sec with bed slope 0.5 metre in 3.2 km. Design the section using Manning's formula. Take N = 0.015.

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