14115

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

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

(2) Answer each next main Question on a new page.

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

(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. Attempt any TEN of the following :   **20**

(a) Define mass density & state its SI unit.

(b) State four application of Hydraulics in environmental engineering.

(c) Define ideal fluid and real fluid.

(d) State Newton's law of viscosity.

(e) A pressure of 1.2 pascal applied to 650 litres of liquid caused a volume reduction by 1.5 litres. Calculate bulk modulus of elasticity for liquid.

(f) Define pressure & state its SI unit.

(g) How will you measure negative pressure ?

(h) Define Reynolds number.

(i) Mention necessity of inverted manometer.

(j) Write modified Darcy-Weisbach equation.

(k) Define Froude's number.

(l) List four uses of pitot tube.

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

(a) State Pascal's law & its practical application.

(b) A circular plate 1.5 m diameter is placed vertically in water so that the centre plate is 2.5 m below the free surface. Determine the total pressure on the plate and depth of centre of pressure.

(c) Draw a neat sketch of pressure diagram showing variation of pressure on vertical side wall of tank and horizontal bottom of tank containing liquid of specific weight 'r' upto a height of 'h'.

(d) Convert the pressure of 0.5 N/mm^2 in metres of liquid of specific gravity 0.7.

(e) A differential manometer connected at the two points A & B on a horizontal pipe. Carrying specific gravity 0.8 shows a difference in mercury levels as 15 cm. Find the difference in pressure at the two points in m of oil and N/m^2.

(f) What is Piezometer and where it is used ?

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

(a) Explain with neat sketch the working of Burdon's tube pressure guage.

(b) State the practical applications and limitations of Bernoulli's theorem.

(c) Distinguish between Laminas and Turbulent flow. (four points each)

(d) A pipe line carrying oil (Sp. Gr. 0.8) changes in diameter from 300 mm at position 1 to 600 mm diameter at position 2 which is 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/s. Determine the loss of head.

(e) At a sudden enlargement of water line a 250 mm diameter to 500 mm diameter pipe, the hydraulic gradient rises by 12 mm. Calculate the discharge through pipe.

(f) What is flow net ? State applications of flow net.

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

(a) Define friction factor & state any four factors affecting friction factor.

(b) Explain HGL and TEL with curve.

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

(d) A diameter of a horizontal pipe suddenly changes from 25 cm to 30 cm. Calculate the loss of head, if discharge is 370 lit/sec.

(e) Two reservoirs having a difference in elevation of 15 m are connected by a 200 mm diameter siphon. The length of the siphon is 400 m and 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 120 mm. Determine the discharge through siphon, if the coefficient of friction is 0.005.

(f) Water is flowing through a rectangular channel of width 8 m and bed slope 1 in 1000. Depth of flowing channel is 5 m. Find the discharge through the channel. Take Chezy's constant C = 50.

5. Attempt any TWO of the following : 16

(a) A trapezoidal channel section has side slope 2 vertical to 3 horizontal. It is discharging water at a rate of 20 cumecs with bed slope 1 in 2000. Design the channel for its best form. Take Manning's constant N = 0.01.

(b) What do you mean by Hydraulic Jump ? Explain with sketch. State the types of hydraulic jump with Froude's number.

(c) A 150 mm × 75 mm venturimeter placed vertically with the throat 22.5 mm above the inlet conveys oils of specific gravity 0.78 at 29 litres per sec. Calculate the difference of pressure between inlet and throat Take C_d = 0.96.

6. Attempt any TWO of the following : 16

(a) Draw a neat sketch of a Reciprocating pump showing its various component parts. Mention function of each component.

(b) A horizontal venturimeter is installed in a pipe of 20 cm diameter carries 50 lps of water with a differential mercury manometer reading of 12.6 cm. Calculate the throat diameter in metre. Assume coefficient of meter is 0.98.

(c) Why triangular notches are preferred than rectangular notches ? Find the discharge over the triangular notch of angle 60° when the head over the notch is 20 cm. Take C_d = 0.625.

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