

17421

15162

3 Hours / 100 Marks

Seat No.

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- 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) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-Programmable Electronic Pocket Calculator is permissible.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any TEN :

20

- (a) Define surface tension. State its units.
- (b) State any two applications of hydraulics with respect to Irrigation.
- (c) State 'Pascal's Law' of liquid pressure.
- (d) How will you measure negative pressure ?
- (e) Define Reynold's number.
- (f) State any two causes of water hammer.
- (g) Write modified Darcy-Weisbach equation.
- (h) Define 'Hydraulic Meandepth' and its units.
- (i) State the conditions for maximum discharge through trapozoidal channel.
- (j) What is the difference between a 'notch' and a 'weir' ?
- (k) Enlist various hydraulic coefficients for orifice and state relation between them.
- (l) Differentiate between the turbines and pumps on any two factors.

P.T.O.

2. Attempt any FOUR :**16**

- (a) State the Newton's law of viscosity and give examples of its application.
- (b) Determine the specific gravity of a fluid having viscosity 0.05 poise and kinematic viscosity 0.035 stokes.
- (c) A rectangular plane surface is 2 m wide and 3 m deep. It lies in vertical plane in water. Determine the total pressure and position of centre of pressure on the plane surface when its upper edge is horizontal and 2.5 m below the free water surface.
- (d) Determine the total pressure and centre of pressure on an isosceles triangular plate of base 4 m and altitude 4 m when it is immersed vertically in an oil of sp.gr 0.9. The base of the plate coincides with the free surface of oil.
- (e) Explain briefly the working principle of Bourdon pressure gauge with a neat sketch.
- (f) A simple manometer (U-tube) containing mercury is connected to a pipe in which an oil of sp.gr 0.8 is flowing. The pressure in the pipe is vacuum. The other end of the manometer is open to the atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 20 cm and height of oil in the left limb from the centre of pipe is 15 cm below.

3. Attempt any FOUR :**16**

- (a) Explain the terms : (i) Streak line (ii) Stream line
- (b) State the uses of flow net with its sketch.
- (c) Find the loss of head when a pipe of diameter 200 mm is suddenly enlarged to a diameter of 400 mm. The rate of flow of water through the pipe is 250 lit/sec.
- (d) An oil of sp.gr 0.9 and viscosity 0.06 poise is flowing through a pipe of diameter 200 mm at the rate of 60 lit/sec. Find the head lost due to friction for a 500 m length of pipe. Take $f = 0.02$.
- (e) Explain HGL and TEL with sketch.
- (f) What do you mean by Hydraulic jump ? Explain with sketch.

4. Attempt any FOUR :**16**

- (a) Find the bedslope of trapezoidal channel of bed width 6 m, depth of water 3 m and side slope of 3 horizontal to 4 vertical, when the discharge through the channel is $30 \text{ m}^3/\text{sec}$. Take Chezy's constant, $C = 70$.
- (b) Find the discharge through a rectangular channel of width 2 m, having a bedslope of 4 in 8000. The depth of flow is 1.5 m and take the value of 'N' in Manning's formula as 0.012.
- (c) A rectangular channel 2.0 m wide has a discharge of 250 lit/sec., which is measured by a right-angled 'V' – notch weir. Find the position of the apex of the notch from the bed of channel if maximum depth of water is not to exceed 1.3 m. Take $c_d = 0.62$.
- (d) Explain the working of venturimeter with a neat sketch.
- (e) What is Priming ? Why is it necessary ?
- (f) With a neat sketch, explain the principle and working of a centrifugal pump.

5. Attempt any TWO :**16**

- (a) An oil of sp.gr 0.8 is flowing through a venturimeter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through the horizontal venturimeter. Take $c_d = 0.98$
- (b) A trapezoidal channel has side slopes of 3 H to 4 V and slope of its bed is 1 in 2000. Determine the optimum dimensions of the channel, if it is to carry water at $0.5 \text{ m}^3/\text{sec}$. Take Chezy's constant as 80.
- (c) 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, and the summit is 3.0 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, $f = 0.005$.

6. Attempt any TWO :**16**

- (a) A circular plate 3.0 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure.
- (b) (i) State 'Bernouli's theorem'.
(ii) A pipeline carry oil of sp.gr 0.87, changes in diameter from 200 mm diameter at a position A to 500 mm diameter at a position B which is 4 m at a higher level. If the pressure at 'A' and 'B' are 9.81 N/cm^2 and 5.886 N/cm^2 respectively and the discharge is 200 lit/sec. Determine the loss of head and direction of flow.
- (c) Explain the following with neat sketches :
- (i) Simple manometer and its types.
(ii) Differential monometers and its types.
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