17421

11819

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) ***Each** sub-question in a question carries **equal** marks unless otherwise specified.*

Marks

1. A) Attempt **any six** of the following :   **12**
   a) State the difference in behaviour of liquid with solids (any two points).
   b) State the Newton's law of viscosity.
   c) Convert :
      i) 10 N/cm^2 in meters of water
      ii) 03 m of mercury in N/m^2.
   d) State any two advantages of simple U-tube manometer over a piezometer.
   e) Write the expression for minor losses in
      i) Sudden enlargement   ii) Exit
   f) Define :
      i) Hydraulic Gradient Line   ii) Energy Gradient Line
   g) Define :
      i) Co-efficient of contraction   ii) Co-efficient of velocity
   h) List any two velocity of flow measuring devices.

   B) Attempt **any two** of the following :   **8**
   a) If the density of liquid is 800 kg/m^3 and its kinematic viscosity as 1.73 cm^2/sec.
      Find its
      i) Specific weight   ii) Dynamic viscosity
      iii) Specific volume   iv) Specific gravity
   b) Define the following and state their S.I. Units.
      i) Dynamic viscosity   ii) Weight density
   c) Explain the concept of pressure diagram and state its use.

P.T.O.

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

a) 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.

b) A square tank 2 m side and 2 m depth contain water to a depth of 1 m and light liquid of specific gravity 0.80 on the water to a depth of 0.60 m. Find the magnitude and location of pressure force on one of the vertical side and bottom of the tank.

c) A partition wall 2 m long divides a storage tank. On one side there is liquid with specific gravity 0.87 upto a depth of 1.5 m. On the other side there is another liquid with specific gravity 0.80 stored to a depth of 1 m. Determine the resultant pressure on the partition wall and the position at which it acts.

d) A simple U-tube manometer is used to measure water pressure in pipe. The left limb of manometer is connected to pipe and right limb is open to atmosphere. The mercury level in left limb is 120 mm below the centre of pipe and in right limb 80 mm above the centre of pipe. Calculate the water pressure in pipe.

e) Define the following types of flow :
  i) Gravity flow   ii) Steady flow
  iii) Uniform flow   iv) Laminar flow

f) State Bernoulli's theorem with its assumption and equation.

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

a) A pipe line carrying an oil of specific gravity 0.9 has a diameter 250 mm at 'A', which is gradually increase to a diameter of 500 mm at 'B', which is 5 m above 'A'. If the pressure at 'A' and 'B' are 125 KPa and 75 KPa respectively and discharge is 225 litres per second, find the loss of head and the direction of flow.

b) Define the following terms :
  i) Reynold's number   ii) Discharge
  iii) Flow net   iv) Stream line

c) Three pipes having same length, same friction factor, but different diameters as 250 mm, 100 mm and 50 mm are connected in parallel. If the total discharge through these pipe is 500 litres per second. Calculate the discharge through each pipe.

d) Explain water hammer in a pipe with its effects and remedial measures.

e) A horizontal pipe of 150 mm diameter is suddenly enlarged to 200 mm diameter. Calculate the loss of head if 12 litres per second of water flows from smaller to larger section. Also calculate the loss of head if the direction of flow is reversed. Take $C_c = 0.62$.

f) Define the following terms :
  i) Wetted area   ii) Wetted perimeter
  iii) Hydraulic mean depth iv) Open channel flow.

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

a) Define most economical channel section and state the conditions for a trapezoidal section to be most economical.

b) A rectangular channel 6 m wide carries water at a rate of 10 m³/s. Calculate the slope required to maintain a depth of 1.5 m.

c) Explain the phenomenon of hydraulic jump and its occurance in field.

d) i) Define : Froud's number and state its significance.
   ii) Write Chezy's equation and Manning's equation used for determination of velocity of flow through open channel.

e) Explain the working of venturimeter with neat sketch.

f) A sharp edged orifice has a diameter of 25 mm and coefficient of velocity and coefficient of contraction are 0.98 and 0.62 respectively. The jet drops 1 m in a horizontal distance of 2.5 m. Determine the flow in m³/s and head over the orifice.

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

a) A reservoir has a catchment area of 20 km². The intensity of maximum rainfall over the catchment is 2.5 cm per hour, 40% of which flows to the reservoir over the weir. Using Francis formula, find the length of weir. The head over the weir does not exceed 80 cm.

b) Sketch and describe cup type current meter.

c) Determine the discharge through 60° triangular notch in m³/s, under the head of 0.16 m, if cd = 0.60.

d) A centrifugal pump has 70% efficiency. It is used to deliver 25 litres per second of water a static head of 17 m. The delivery and suction pipe together are 90 m long and are 100 mm diameter and f = 0.04 for both pipes. Calculate the power of pump.

e) Enlist any four component parts of centrifugal pump, with their functions.

f) Define : Turbine and state its necessity and types.

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

a) Explain construction and working of "Bourdon's pressure gauge with neat sketch.

b) Two reservoirs are connected by a siphon pipe, the vertex of which is 2 m above the level of water in the higher reservoir. The length of the pipe from inlet to vertex is 600 m and from vertex to outlet is 800 m. The pipe diameter is 1000 mm. If the pressure at the vertex is 2.5 m of water absolute. Find the discharge and level difference between the reservoir. Take f = 0.04. The pressure is 10.33 m of water absolute.

c) Design a section of an unlined channel to carry a discharge of 6 m³/s with a bed slope of 1 to 3600 and side slope 1.5 H : 1 V. The average velocity of flow is not to exceed 0.667 m/s. Take N = 0.025.

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