

16117

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

- (a) Define the terms hydrostatics and hydrodynamics.
- (b) The mass density of oil is  $985 \text{ kg/m}^3$ . What is its specific gravity ?
- (c) Enlist any four pressure measuring devices.
- (d) Convert pressure of 10 m of oil of specific gravity 0.90 into pressure head of m of liquid having specific gravity 1.2.
- (e) Write Darcy-Weisbach equation for loss of head in pipes due to friction.
- (f) Define HGL & TEL.
- (g) Define  $C_c$  &  $C_v$ .
- (h) Draw a sketch showing orifice and vena contracta.

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

- (a) How liquids behaves differently from solids ? Explain.
- (b) A liquid weighs 15 kN and occupies  $3 \text{ m}^3$ . Find its specific weight, mass density and specific gravity.
- (c) State Pascal's law and give its use.

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

- (a) What is meant by pressure diagram ? State its use.
- (b) A tank square in plan with vertical sides contain oil of specific gravity 0.91 up to a depth of 2 m. The tank size is  $2\text{ m} \times 2\text{ m} \times 2.5\text{ m}$ . Find the total pressure and position of centre of pressure on one side of tank.
- (c) A circular plate 2 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 3 m and 2 m respectively. Determine the total pressure on one face of the plate and position of the centre of pressure.
- (d) U tube differential mercury Manometer is connected to horizontal pipe carrying water at two points A and B. The difference in levels of mercury in the two limbs is 12.5 cm. Calculate pressure difference at A and B in  $\text{kN/m}^2$ .
- (e) Enlist various flow combinations with examples.
- (f) Distinguish between Laminar and Turbulent flow.

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

- (a) Water is flowing through a horizontal pipe having diameters 250 mm and 150 mm at sections A and B respectively. The discharge passes through pipe is 40 lit/s. If pressure at section A is  $250\text{ kN/m}^2$ , calculate pressure at section B. Neglect losses.
- (b) While performing the experiment of Reynolds number, a batch of students observed actual discharge of  $4.4 \times 10^{-6}\text{ m}^3/\text{s}$  from a pipe of 2.5 cm dia. The dynamic viscosity ( $\mu$ ) of water at room temperature  $25^\circ\text{C}$  was  $0.824 \times 10^{-3}\text{ N-S/m}^2$ . Identify the flow observed and draw the sketch of it.
- (c) Explain the Moody's diagram and state its use.
- (d) Calculate the loss of head per kilometer length of a new cast iron pipe having 20 cm diameter friction factor  $f = 0.04$ , discharge of water 12 lit/sec.
- (e) Explain hydraulic gradient line and total energy line.
- (f) Define w.r.t. open channel flow :
  - (i) Prismatic channel
  - (ii) Wetted area
  - (iii) Wetted perimeter
  - (iv) Hydraulic radius

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

- (a) Differentiate between pipe flow and open channel flow.
- (b) What is most economical channel section ? Write conditions for trapezoidal channel section to be economical.
- (c) Define Hydraulic jump. Write locations where hydraulic jump occurs.
- (d) Water flows through rectangular open channel having width 2 m with flow depth of 0.6 m with discharge of  $4 \text{ m}^3/\text{sec}$ . Find froudes No., Is flow subcritical or supercritical ? Also find critical depth of flow.
- (e) Explain working of venturimeter with the help of neat sketch.
- (f) A vertical sharp edged orifice 110 mm dia. discharges 90 lps under a head of 9 m. A point on the jet has its horizontal and vertical co-ordinates of 4.5 m and 0.54 m respectively, measured from vena contracta. Find Cd, Cc, Cv.

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

- (a) How will you measure the velocity of river water with the help of floats ?
- (b) Determine discharge through  $55^\circ$  triangular notch when head over notch is 0.65 m. Take  $C_d = 0.6$ .
- (c) Find the discharge over a rectangular weir of length 80 m. The head of water over the weir is 1.5 m. The velocity of approach is given as 1.3 m/s. Take  $C_d = 0.6$ .
- (d) State the criteria for selecting pump.
- (e) Differentiate between centrifugal and reciprocating pump.
- (f) A centrifugal pump is required to pump 12 lit/sec. against a head of 35 m. Find the power required by the pump, taking overall efficiency as 70%.

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

- (a) Explain the following and indicate their relative position with neat sketch :
  - (i) Atmospheric pressure
  - (ii) Gauge pressure
  - (iii) Negative pressure
  - (iv) Absolute pressure

- (b) 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 to the summit is 120 m and the friction factor is 0.02.

Determine :

- (i) Discharge through siphon
  - (ii) Pressure at summit.
- (c) 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 most economical channel. Take Manning's constant  $N = 0.01$ .
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