17421

15116

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) 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**

(i) Define ideal fluid and real fluid.

(ii) State Newton's law of viscosity and state unit of dynamic viscosity.

(iii) State two limitations of piezometer.

(iv) Express 8.5 m of mercury in N/mm^2.

(v) List four types of minor losses.

(vi) What is equivalent pipe? Write the equation used for it.

(vii) Draw diagram of vena - contracta.

(viii) Define orifice and write down the equation used for small circular orifice to determine coefficient of velocity.

Marks

b) **Attempt any <u>TWO</u> of the following:** **8**

(i) Write a note on application of hydraulics in Irrigation Engineering and Environmental Engineering.

(ii) Calculate the kinematic viscosity of water whose specific weight 9810 N/m^3 and viscosity is 0.0011 $N.s/m^2$.

(iii) 1) Define pressure, state its SI unit. 2

2) State pascals law. 2

2. Attempt any <u>FOUR</u> of the following: **16**

a) Define total hydrostatic pressure and centre of pressure. Draw diagram to describe it.

b) A masonry dam 8 m high and 3.5 m wide has water level 1 m below its top. Calculate

(i) Total pressure on one meter length of dam.

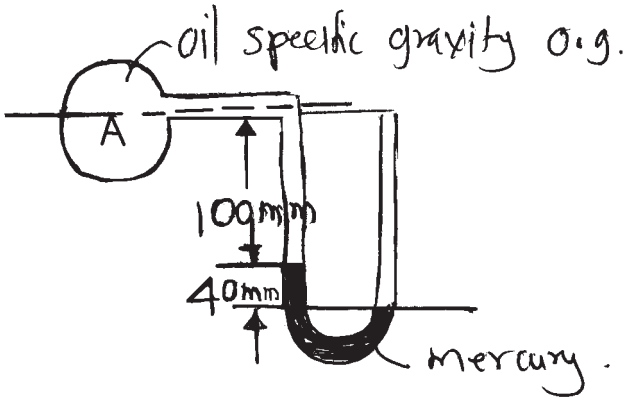
(ii) Depth of centre of pressure.

c) A circular plate 2.5 m diameter is immersed in oil of specific gravity 0.9 such that its greatest and least depth below the free surface oil 3.0 m and 1 m. Calculate

(i) Total pressure on one surface of plate.

(ii) Depth of centre of pressure.

d) A simple monometer containing mercury was used to determine the pressure in pipe containing a liquid of specific gravity 0.9 as shown in Figure No. 1. Calculate the pressure in N/cm^2 at A.



<u>Fig. No. 1</u>

Marks

e) Define datum head, velocity head pressure head and write down Bernoullis equation.

f) Write procedure for Renold's experiment for finding out type of flow.

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

a) A conical tube is fixed vertically with its smaller end upward having diameter 150 mm and 300 mm at bottom. Length of pipe is 10 m. Pressure at bottom is 300 Kpa and velocity at bottom is 3 m/s. Find pressure at top of pipe if loss of head is 2 m of water.

b) A sloping pipeline has diameter of 1 m at higher end and 50 cm at lower end. It carries liquid at sp.gr. 0.75 at 48000 lpm. The length of pipe is 350 m and it is laid on slope 1 in 100. The pressure at lower end is 1200 kN/m^2. Determine the pressure at higher end of pipe.

c) Explain the terms

(i) Pipes in parallel

(ii) Equivalent pipe

d) Three pipes having same length and same friction factor having different diameter 250 mm, 100 mm, 75 mm respectively when three pipes are connected in parallel gives total discharge 0.75 m^3/s. Find out discharge in each pipe.

e) Explain syphon pipe with sketch.

f) Explain with neat sketch different types of open channel. (any four)

Marks

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

a) Define wetted area and wetted perimeter and write the formulas for the same for trapezoidal section.

b) State the conditions of most economical rectangular section and trapezoidal section.

c) Define hydraulic jump and state its two applications.

d) Explain venturimeter with a neat sketch.

e) Explain critical flow and subcritical flow.

f) A 100 mm diameter orifice discharges 40 lit/sec liquid under constant head of 2 m. The diameter of jet at vena - contracta is 90 mm. Calculate C_d, C_e, C_v.

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

a) Write a short note on floats.

b) Determine the discharge through 60° triangular notch in lit/sec under head of 0.15 m. Take Cd = 0.6.

c) Water is flowing over 4 m long weir under a head of 1.2 m. Calculate the discharge over weir if Cd = 0.6.

d) Draw neat sketch of reciprocating pump. (double acting)

e) Compare reciprocating pump and centrifugal pump on any four points.

f) A centrifugal pump is required to pump 15 lit per second against head of 35 m. Find the power required by the pump taking overall efficiency 80%.

Marks

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

a) Explain construction and working of Bourdon's pressure gauge with sketch. Write advantages of it.

b) Two reservoirs having difference in elevation of 12 m are connected by 200 mm diameter syphon. The length of syphon is 400 m and summit is 3 m above water level in upper reservoir. The length of pipe from reservoir (upper) to summit is 120 m. Determine discharge through syphon and pressure of summit. (neglect minor losses)

c) Design most economical trapezoidal section having side slopes 1.5:1 (H:V). For discharge 10 m^3/s and bed slope 0.6 m in 3 km. Take N = 0.015. (manning's constant).