17421

11920

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.

Marks

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

(a) Differentiate real and ideal fluid.

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

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

(d) How will you measure negative pressure ?

(e) State Darcy Weisbatch equation for frictional loss.

(f) List four types of minor losses.

(g) What is the difference between a notch and weir ?

(h) State the significance of C_d and C_v in flow through orifice.

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

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

(b) Calculate the kinematic viscosity of oil whose Sp. gravity is 0.9 and viscosity is 0.1 N-S/m^2.

(c) State Pascal's law and its practical applications.

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

(a) A circular plate 3.0 m diameter immersed in water vertically 2.0 m below free liquid surface. Find centre of pressure and total pressure.

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

(c) A square tank 1 m × 1 m in plan and 2 m deep contains oil of Sp. gravity 0.85. The free liquid surface of oil is 50 cm below top of tank. Find total pressure and position of centre of pressure on side and bottom of tank.

(d) A differential manometer connected at the two points A and B on a horizontal pipe. Calculate difference in pressure at the two points in M of oil and N/m^2, if pipe carries oil of Sp. gravity 0.8 and it shows difference in mercury levels as 15 cm.

(e) Distinguish between Laminar and Turbulent flow.

(f) Define and draw flow net. State properties and applications of flow net.

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

(a) A pipeline gradually varies from 15 cm diameter at 'A' to 7.5 cm diameter at 'B'. The point 'A' is 6 m above datum, while point 'B' is 3 m above datum. The velocity at 'A' is 3.6 m/sec. Determine pressure at 'B' if pressure at 'A' is 9.81 N/cm^2.

(b) Velocity of flow of water in pipe line of 300 mm diameter is 2 m/s from which 40 mm diameter pipe branches out. Velocity measured in the branch pipe is 3 m/s. What is the velocity of water in main pipe beyond the branch line ?

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

(d) 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.

(e) Explain the terms (i) Pipes in parallel, (ii) Equivalent pipe.

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

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

(a) Define Hydraulic sump and state its applications.

(b) Define steady, unsteady, uniform and non-uniform flow in open channel.

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

(d) 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 discharge through channel. Take Chezy's const C = 50.

(e) Explain the working of venturimeter with a neat sketch.

(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_c, C_v.

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

(a) Explain working principle of current meter with sketch.

(b) Determine the discharge through 60° triangular notch in lps under the head 0.16m. $C_d = 0.6$.

(c) A reservoir has a catchment area of 30 km^2. The maximum rainfall over the area is 2.5 cm/hr, 45% of which flows to reservoir over a weir. Find length of the weir. The head over weir is 80 cm.

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

(e) What is priming ? Why is it necessary ?

(f) A centrifugal pump is required to pump 10 lit/second against a head of 40 m. Find the power required by the pump taking overall efficiency as 70%.

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

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

(b) 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 upper reservoir. The length of pipe from upper reservoir to 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.

(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 channel for its best form. Take Manning's constant N = 0.01.
