7226

BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2023

DCE - THIRD SEMESTER EXAMINATION

HYDRAULICS

Time : 3 Hours]   [*Total Marks* : 80

PART—A   3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. Define the terms *(a)* ideal fluids and *(b)* real fluids.

2. Find the depth of a point below water surface where pressure intensity is 1.2 Mpa.

3. State the equation of continuity of flow.

4. Define the terms *(a)* vena-contract and *(b)* coefficient of resistance.

5. What is notch? Classify the notches based on the shape of opening.

6. Water is passing over a rectangular notch 200 mm wide under a constant head of 100 mm. Find the coefficient of discharge, if the water is being collected in the tank at the rate of 11·2 lit/sec.

7. State Darcy's formula and Chezy's formula for loss of head due to friction in pipes.

8. What is meant by most economical section of the channel?

9. State any three main parts of a Francis turbine.

10. Draw a neat sketch of hydro-electric power plant.

Instructions : (1) Answer **all** questions.

(2) Each question carries **eight** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* A rectangular body 2 m × 4 m is immersed inclined to free surface of liquid such that the greatest and least heights are 3 m and 1 m respectively. Calculate the total pressure and centre of pressure. 8

(OR)

(b) The diameter of a pipe changes gradually from 150 mm at point *A* to 100 mm at point *B*, which are situated at 20 m and 16 m respectively above the datum. Determine the pressure at *B*, if the pressure at *A* is 0.2 N/mm^2 and velocity of flow at *A* is 1.1 m/sec. Neglecting losses between *A* and *B*. 8

12. *(a)* Water flows through a circular orifice of 25 mm diameter provided in the side of a tank discharging water under a constant head of 800 mm. The coordinates at a certain point of the jet are 320 mm from the vena-contract horizontally and 32 mm vertically below the centerline of the orifice. The water is collected in a tank of size 600 mm × 600 mm and collected water rises by 30 mm in 10 seconds. Find C_c, C_v and C_d. 8

(OR)

(b) *(i)* Deduce the relationship between the three hydraulic co-efficients. 4

(ii) An internal mouthpiece of diameter 60 mm is discharged water under a constant head of 9 m. Find the discharge in lit/sec, if the mouthpiece is *(i)* running free and *(ii)* running full. 4

13. *(a)* The catchment area of a tank is 5 × 10^6 m^2. The maximum rainfall in the catchment is 50 mm per hour. Out of this 80% will reach the tank. Find the length of the weir if the head of water is not to exceed 1 m. The weir has to carry piers 1 m wide and 5 m clear span for supporting a superstructure. Assume C_d = 0.60. 8

(OR)

(b) A right angled V-notch was used to measure the discharge of a centrifugal pump. If the depth of water at V-notch is 200 mm, calculate the discharge over the notch in liters per minute. Take C_d as 0.62. 8

14. *(a)* Water flows through a pipe 200 mm diameter, 60 m long with a velocity of 2.5 m/sec. Find the head loss in friction using *(i)* Darcy's formula and *(ii)* Chezy's formula. Assume Chezy's constant as 55 and coefficient of friction *f* = 0.01.   8

(OR)

(b) Two reservoirs are connected by a pipeline of 22 m long consisting of two pipes, one of 15 cm diameter and length 6 m, and the other of diameter 22.5 cm and 16 m long. If the difference of water levels in the two reservoirs is 6 m, calculate the discharge considering all losses. Take, f = 0.04 and $h_f = \dfrac{fLV^2}{2gd}$.   8

15. *(a)* A trapezoidal channel has side slope 2 vertical to 3 horizontal. It is discharging water at the rate of 20 cumecs with a bed slope 1 in 2000. Design the channel for its best form. Use Manning's formula. Taking N = 0.01.   8

(OR)

(b) A rectangular channel carries water at the rate of 400 lit/sec when the bed slope is 1 in 2000. Find the most economical dimension of the channel, If manning's constant n as 0.012.   8

PART—C   10×1=10

Instructions :   (1) Answer the following question.

                  (2) The question carries **ten** marks.

                  (3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

16. A venturimeter is to be fitted to a pipe of 250 mm diameter where the pressure head is 7.5 m of flowing liquid. If the maximum flow through venturimeter is 9000 lit/min., find the least diameter of the throat to ensure that the pressure head does not become negative. Take C_d = 0.97.

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