Roll No. .....

3080

B. Tech. 4th Semester (Civil)

Examination – May, 2023

HYDRAULIC ENGINEERING

Paper : PCC-CE-202-G

Time : Three hours] *[Maximum Marks : 75*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting ***one*** question from each Unit. Question No. **1** is ***compulsory***. All questions carry equal marks.

1. Explain the following terms : $2.5 \times 6 = 15$

(a) What do you understand by turbulent flow ?

(b) Kinetic Energy correction Factor.

(c) Hydraulic mean Depth.

(d) Sketch the velocity distribution across a section of pipe.

(e) Hydraulic gradient line.

(f) Name the different forces present in fluid flow.

UNIT – I

2. (a) Derive an expression for velocity distribution for Laminar flow through circular pipe. 7.5

   (b) A laminar flow is taking place in a pipe of diameter 200 mm. The maximum velocity is 1.5 m/s. Find the mean velocity and the radius at which this occurs. 7.5

3. Obtain an Expression for velocity distribution in turbulent flow for (i) smooth pipe and (ii) Rough Pipes. 15

UNIT – II

4. At a sudden enlargement of water main from 240 mm to 480 mm diameter, the hydraulic gradient rises by 10 mm. Estimate the rate of flow. 15

5. A horizontal pipe line 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. The height of water level in the tank is 8 m above the centre of the pipe. Considering all losses of head which occur, determine the rate of flow. Take f = 0.01 for both sections of the pipe. 15

UNIT – III

6. A concrete lined circular channel of diameter 3 m has a bed slope of 1 in 500. Work out the velocity and flow rate for the conditions of (i) maximum velocity and (ii) maximum discharge. Assume Chezy's C = 50. 15

7. Obtain an relationship between the Froude Numbers of flow before and after the hydraulic jump in horizontal rectangular channel. 15

UNIT – IV

8. Prove that the loss of energy head in a hydraulic jump is equal to $(d_2 - d_1)^3 / d_1 d_2$, where d_1 and d_2 are the conjugate depths. 15

9. A 300 mm diameter pipe carries water under a head of 20 meters with a velocity of 3.5 m/s. If the axis of the pipe turns through 45°, find the magnitude and direction of the resultant force at the bend. 15
