

3080

B.Tech. (Civil) 4th Semester (G-Scheme)

Examination, July-2022

HYDRAULIC ENGINEERING

Paper- PCC-CE-202-G

Time allowed : 3 hours]

[Maximum marks : 75

Note : Attempt five questions selecting one question from each unit and Question no. 1 is compulsory.

1. Define any six from the following:- $6 \times 2.5 = 15$

- (i) Shear stress in turbulent flow
- (ii) Loss of head due to sudden expansion and sudden contraction
- (iii) Uniform and non-uniform flow
- (iv) Length of hydraulic jump
- (v) Equivalent Pipe
- (vi) Laminar and turbulent flow
- (vii) Location of hydraulic jump
- (viii) Chezy's and Manning's formula

Unit - I

2. (a) Derive any two of following for flow of laminar fluid through a circular pipe:- 10

- (i) Velocity distribution

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- (ii) Ratio of maximum velocity to average velocity
- (iii) Drop of pressure for a given length of a pipe.
- (b) Write a short note on Stoke's law. 5
3. (a) Explain Reynold's experiment with a neat sketch. 7
- (b) A smooth pipe of diameter 400 mm and length 800 m carries water at the rate of $0.04 \text{ m}^3/\text{s}$. Determine the head lost due to friction, wall shear stress, centre-line velocity and thickness of laminar sub-layer. Take the kinematic viscosity of water as 0.020 stokes. 8

Unit - II

4. (a) Explain various energy losses through pipes. 8
- (b) The rate of flow of water through a horizontal pipe is $0.25 \text{ m}^3/\text{s}$. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm^2 . 7

Determine:

- (i) Loss of head due to sudden enlargement
- (ii) Pressure intensity in the large pipe
5. (a) Explain Water hammer process in brief with a neat sketch. 5
- (b) A Pipe line of 0.6 m diameter is 1.5 km long. To increase the discharge, another line of the same diameter is introduced parallel to the first in the second half of the length. Neglecting minor losses, find the increase in discharge if $4f = 0.04$. The head at inlet is 300 mm. 10

Unit - III

6. (a) Define most economical section. Derive conditions for most economical rectangular channel section. 7
- (b) A Trapezoidal channel has side slopes of 3 horizontal to 4 vertical and slope of its bed is 1 in 2000. Determine the optimum dimensions of the channel, if it is to carry water at $0.4\text{m}^3/\text{s}$. Take Chezy's constant as 70. 8
7. Explain:-
- (a) Specific energy and specific energy curve 7
- (b) Critical depth 4
- (c) Critical Velocity 4

Unit - IV

8. (a) Define Hydraulic jump. Write different types of hydraulic jump and various applications of hydraulic jump. 8
- (b) The depth of flow of water, at a certain section of a rectangular channel of 2 m wide, is 0.3 m. The discharge through the channel is $1.5\text{m}^3/\text{s}$. Determine whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water. 7
9. (a) What is surge in an open channel? Derive an expression for positive surge due to sudden reduction of flow. 10
- (b) Explain momentum principle. 5