

- (b) Find the critical depth and critical velocity of the water flowing through a rectangular channel of width 5 m, when discharge is  $15 \text{ m}^3/\text{s}$ . 5
- (c) Find the rate of change of depth of water in a rectangular channel of 10 m wide and 1.5 m deep, when the water is flowing with a velocity of 1 m/s. The flow of water through the channel of bed slope 1 in 4000, is regulated in such a way that energy line is having a slope of 0.00004. 5

**UNIT - IV**

8. (a) 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
- (b) What is hydraulic jump? Write down different types of hydraulic jump and various applications of hydraulic jump. 8
9. (a) Define surge in an open channel. Derive an expression for positive surge due to sudden increase of flow. 10
- (b) Explain the moment of momentum equation. 5

Roll No. ....

**3080**

**B. Tech. 4th Semester (Civil)**  
**Examination - July, 2021**  
**HYDRAULIC ENGINEERING**  
 Paper : PCC-CF-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 by selecting one question from each Unit and question no. 1 is compulsory.

1. Define any six from the following : 2.5 × 6 = 15
- (i) Causes of turbulence
  - (ii) Loss of head due to obstruction and bend in pipe
  - (iii) Sub-critical, critical & super-critical flow
  - (iv) Elements & characteristics of hydraulic jump
  - (v) Loss of head due to sudden expansion and sudden contraction in pipe
  - (vi) Steady and unsteady flow
  - (vii) Branching of pipes
  - (viii) Differentiate between Open Channel flow and Pipe flow

### UNIT - I

2. (a) Derive any *two* of the following for laminar flow between two parallel fixed plates : 10
- (i) Velocity distribution
- (ii) Ratio of maximum velocity to average velocity
- (iii) Drop of pressure head for a given length
- (b) Name various methods adopted for measurement of viscosity of a fluid and write in brief about any *one*. 5
3. (a) Describe 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 0.016 stokes. 8

### UNIT - II

4. (a) The rate of flow of water through a horizontal pipe is  $0.30 \text{ m}^3/\text{s}$ . The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is  $11.772 \text{ N/cm}^2$ . Determine : 7

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(2)

- (i) Loss of head due to sudden enlargement
- (ii) Pressure intensity in the large pipe
- (b) Explain Pipes in series and parallel with diagrams and its expression. 8
5. (a) Define hydraulic gradient line and total energy line with diagram. 6
- (b) A Pipe of diameter 20 cm and length 2000 m connects two reservoirs, having difference of water levels as 20 m. Determine the discharge through the pipe. If an additional pipe of diameter 20 cm and length 1200 m is attached to the last 1200 m length of the existing pipe, find the increase in the discharge. Take  $f = 0.015$  and neglect minor losses. 9

### UNIT - III

6. (a) A rectangular channel carries water at the rate of 300 liters/sec when bed slope is 1 in 2000. Find the most economical dimensions of the channel if  $C = 40$ . 7
- (b) What is most economical section ? Derive conditions for the most economical trapezoidal channel section. 8
7. (a) Classify various surface profiles in brief. 5

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(3)

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