



## Term Evaluation (Even) Semester Examination March 2025

Roll no.....

Name of the Course: B. Tech (Civil Engineering)

Semester: IV

Name of the Paper: Hydraulics and Hydraulic Machines

Paper Code: TCE 401

Time: 1.5 hour

Maximum Marks: 50

**Note:**

- (i) Answer all the questions by choosing any one of the sub-questions
- (ii) Each question carries 10 marks.
- (iii) Please specify COs against each question.

**Q 1.** 10 Marks

- a) State Rayleigh method of dimensional analysis and explain procedure for the analysis.

(OR)

- b) A pump develops a power  $P$  which is a function of the discharge ( $Q$ ), the head ( $H$ ) and the specific weight ( $\gamma$ ) of the fluid. Show that  $P = KQ\gamma H$ . Where,  $K$  is a dimensionless constant.

CO 1

CO 1

**Q 2.** 10 Marks

- a) Show that for critical flow at a section the Froude's number is equal to unity

CO 1

(OR)

- b) A trapezoidal Channel having the side slope equal to  $60^\circ$  with the horizontal and laid on a slope of 1 in 750, carries a discharge of  $10 \text{ m}^3/\text{s}$ . Find the width at the base and depth of the flow for the most economical section. Take Chezy's  $C = 66$ .

CO 1

**Q 3.** 10 Marks

- a) Draw a neat sketch of specific energy curve for an open channel with constant discharge and show the regions of subcritical, critical and supercritical flow on it.

CO 1

(OR)

- b) A rectangular channel has a width of 2.0 m and carries a discharge of  $4.80 \text{ m}^3/\text{s}$  with a depth of 1.60 m. at a certain section a small, smooth hump with a flat top and of height 0.10 m is proposed to be built. Calculate the likely change in the water surface. Neglect the energy loss.

CO 1

**Q 4.** 10 Marks

- a) Show that the brink depth is two-third of critical depth in an open rectangular channel

CO 2

(OR)

- b) A 3.6m wide rectangular channel conveys  $9 \text{ m}^3/\text{s}$  of water with a velocity of 6 m/s. Is there a condition for hydraulic jump to occur? If so, calculate the height of jump and loss of energy.

CO 2

**Q 5.** 10 Marks

- a) What do you understand by Surges in open channel? Differentiate between positive and Negative Surges.

CO 2

(OR)

- b) In a tidal river the depth and velocity of flow are 0.90m and 1.25m/s respectively. Due to tidal action a tidal bore of height 1.20m is observed to travel upstream. Estimate the height and speed of the bore and the speed of flow after the passage of bore.

CO 2