

**II B. Tech II Semester Supplementary Examinations, December - 2022**  
**HYDRAULICS AND HYDRAULIC MACHINERY**  
 (Civil Engineering)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions each Question from each unit  
 All Questions carry **Equal** Marks

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**UNIT-I**

- 1 a) Derive an expression for the discharge through a channel by chezy's formula and Analyze. [7M]  
 b) Find velocity, rate of flow through a rectangular channel of 6mts wide and 3mts deep, when it is running full. The channel is having a bed slope as 1 in 2000. Take Chezy's Constant  $C=55$  analyze [7M]

**Or**

- 2 a) Derive the conditions for most economical section of a rectangular channel analyze. [7M]  
 b) The discharge of water through a rectangular channel of width 8mts is  $15\text{m}^3/\text{sec}$  When the depth of flow of water is 1.2mts. Calculate specific energy of the Flowing water; critical depth and critical velocity; value of minimum specific Energy. [7M]

**UNIT-II**

- 3 a) Derive an expression for the depth of hydraulic jump in terms of upstream Froude number. [7M]  
 b) Differentiate between critical, sub critical flows. [7M]

**Or**

- 4 a) Define energy dissipation. [4M]  
 b) The discharge of water through a rectangular channel of width 8mts is  $15\text{m}^3/\text{sec}$  When the depth of flow of water is 1.2mts. Calculate specific energy of the Flowing water; critical depth and critical velocity; value of minimum specific Energy. [10M]

**UNIT-III**

- 5 a) Describe the rayleigh's method for dimensional analysis. [7M]  
 b) Explain the different laws on which models are designed for dynamic similarity. Where are they used? [7M]

**Or**



- 6 a) The pressure difference in a pipe of diameter 'D' and length 'L' due to turbulent Flow depends upon velocity; viscosity; density; roughness using Bunkhingam's Theorem obtain expression for pressure difference. [7M]
- b) Determine the dimensions of the given quantities; Discharge, Force, Specific Weight, angular acceleration, dynamic viscosity, kinematic viscosity. [7M]

**UNIT-IV**

- 7 a) Prove that the force exerted by a jet of water on a fixed semi –circular plate in the direction of jet when the plate strikes the centre of the semi –circular plate is two times the force exerted by the jet on an fixed vertical plate. Evaluate. [7M]
- b) For a curved radial vane, find the work done per second? Evaluate. [7M]

**Or**

- 8 a) A jet of water of diameter of 100mm strikes a curved plate at its center with a velocity of 15m/s. The curved plate is moving with a velocity of 7 m/s in the direction of jet. The jet is deflected trough an angle of 150°. Assuming the plate smooth fine: i) force exerted on the plate in the direction of the jet ii) power of the jet iii) efficiency. Evaluate [7M]
- b) A jet of water of diameter 50mm, having a velocity of 30m/sec. strikes a curved vane which is moving with a velocity of 15m/sec in the direction of jet. The jet leaves the vane at an angle of 60°, to the direction of motion of vanes at outlet. Determine: i) Force exerted by the jet on the vane in the direction of motion ii) Worked done per second by the jet. Evaluate [7M]

**UNIT-V**

- 9 a) Define a draft tube. What are its functions? [7M]
- b) Define cavitation. How can it be avoided in reaction turbine? Evaluate. [7M]

**Or**

- 10 a) Define the specific speed of a centrifugal pump. Derive an expression for the same. [7M]
- b) The diameter of a centrifugal pump , which is discharging  $0.035 \text{ m}^3/\text{s}$  of water against a total head of 25 m is 0.05m the pump is running at 1200 rpm. find the head, discharge and ratio of power of a geometrically similar pump of diameter 0.3 m when it is running at 2000 rpm. [7M]

