

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

Time: 3 hours

Max. Marks: 75

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

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- 1 a) A circular channel of 2m diameter laid down with 5° inclination to the horizontal ground. Find out the discharge through the pipe when the depth of water in the pipe is 80 cm. Take C=60. [8M]
- b) What are the fundamental differences between flow through pipe and flow through open channel? [7M]
- Or
- 2 a) Derive the conditions for most economical section of a rectangular channel. [8M]
- b) A base width of a trapezoidal channel section is 5 m and side slopes are 1:2. The depth of water is 2.5m. Find the discharge through the channel using chezy's constant=50. The bed slope of the channel 1 in 1000. [7M]
- 3 a) Explain the following terms: (i) Gradually varied flow (ii) Rapidly varied flow. [5M]
- b) A rectangular channel has a width of 2.0 m and carries a discharge of 3 m<sup>3</sup> /s. If the depth of flow at a section is 0.35m calculate the specific energy at that section and the depth alternate to the existing depth. [10M]
- Or
- 4 a) Give the applications of hydraulic jump. [5M]
- b) A rectangular channel 10 m wide having a bed slope of 0.0001 carries a discharge of 40 m<sup>3</sup>/sec. At particular location, the depth is 1.8m. If the depth at another section is 2.5m, decide the type of the channel and zone of the flow. [10M]
- 5 a) What is the dimensional analysis? How is this analysis related to the theory of similarity? [7M]
- b) The drag force exerted by a flowing fluid on a solid body depends upon the length of the body L, velocity of flow V, density of fluid ρ Viscosity μ . Find an expression for drag force using Buckingham's theorem. [8M]
- Or
- 6 a) For laminar flow in a pipe the drop in pressure ΔP is a function of the pipe length L, its diameter D, mean velocity of flow V and the dynamic viscosity . Using Rayleigh's method, develop an expression for ΔP. [8M]
- b) What is the significance of the following non-dimensional numbers: [7M]  
 (i) Reynolds number (ii) Froude number and (iii) mach number.
- 7 a) A jet has direct impact on a plate moving in the direction of the jet. Prove that the force acting on the plate and work done are given by [8M]  
 $F = \rho A (V-U)^2$   
 $W = \rho A (V-U)^2 * U$
- b) A jet of water of diameter 10cm moving with a velocity of 35m/s strikes a fixed plate in such a way that the angle between the jet and plate is 70°. Find the force exerted by the jet on the plate: (i) In the direction normal to the plate [7M]  
 (ii) In the direction of the jet

Or



- 8 A jet water strikes to a moving blade which has a velocity of 10 m/sec. The jet enters the blade at an angle  $30^\circ$  and leaves at  $160^\circ$  to the direction of blade motion. If the absolute velocity of jet at the entry is 25 m/sec. Find: (i) the blade angles at the entry and exit (ii) work done per kg of water (iii) efficiency. [15M]
- 9 a) A pelton wheel has a mean bucket speed of 15 metres per second with a jet of water flowing at the rate of 750 litres/s under a head of 40 metres. The buckets deflect the jet through an angle of  $160^\circ$ . Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98. [8M]
- b) By means of a neat sketch, explain the governing mechanism of a turbine. [7M]
- Or
- 10 a) A double –acting reciprocating pump running at 50 rpm is discharging 1.5m of water per minute. The pump has a stroke of 500mm .the diameter of the piston is 200mm. the delivery and suction head are 25m and 10m respectively. Find the slip of the pump and power required to drive the pump. [7M]
- b) Explain the principle and working of a centrifugal pump with neat sketch. [8M]

