

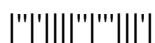
II B. Tech II Semester Regular Examinations, August/September - 2021
HYDRAULICS AND HYDRAULIC MACHINERY
 (Civil Engineering)

Time: 3 hours

Max. Marks: 75

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

- 1 a) Derive expression for kinetic energy correction factor. [8M]  
 b) A trapezoidal channel discharging water at the rate of  $150 \text{ m}^3/\text{sec}$  is to be designed for minimum cross sectional area. Find the bottom width of the channel and depth of water. The side slope is  $45^\circ$ . [7M]  
 Take bed slope as 1 in 1000 and  $C=50$ .
- Or
- 2 a) Derive an expression for the discharge through a channel by chezy's formula. [8M]  
 b) Find the most economical cross section of a rectangular channel to carry  $0.5 \text{ m}^3/\text{sec}$  of water when channel slope is 1 in 1000. Take  $C=50$ . [7M]
- 3 a) Explain the terms: (i) rapid varying flow (ii) gradually varying flow. [6M]  
 b) Define hydraulic jump. Explain various types hydraulic jump. Derive the head loss in hydraulic jump. [9M]
- Or
- 4 a) A rectangular channel 10 m wide having a bed of 0.0001 carries a discharge of  $30 \text{ m}^3/\text{sec}$ . At particular location, the depth is 1.6m. If the depth at another section is 2m, decide the type of the channel and zone of the flow. [7M]  
 b) Derive the dynamic equation for gradually varied flow. [8M]
- 5 a) What are the various types of similarities? Are these similarities truly attainable? If not why? [5M]  
 b) State and explain Rayleigh method for the dimensional analysis with a suitable example. Also explain the advantages of using this theorem. [10M]
- Or
- 6 The resistance force  $F$  of a ship is a function of  $L$  (length),  $v$  (velocity),  $g$  (gravitational acceleration) and fluid properties  $\rho$  and  $\mu$ . Find out a non dimensional relationship for the above problem. [15M]
- 7 a) Find an expression for the efficiency of a series of moving curved vanes when a jet of water strikes the vanes at one of its tips. Prove that the maximum efficiency is when  $u=V$  and the value of maximum efficiency is 50%. [7M]  
 b) A Jet of water of 80 mm diameter with a velocity of 25 m/sec strikes a series of flat plates arranged around the periphery of a wheel such that each plate appears successively before the Jet. If the plates are moving at a velocity of 6 m/sec, find the force exerted by the Jet on the plate, work done per second and efficiency. [8M]
- Or
- 8 a) A 40m/s velocity jet of water strikes without shock a series of vanes moving at 10m/s. The jet is inclined at an angle of  $20^\circ$  to the direction of motion of vanes. The relative velocity of jet at outlet is 0.9 times of the value of the inlet and the absolute velocity of water at exit is to be normal to the motion of vanes. Determine (i) Vane angles at entrance and exit (ii) Work done on vanes. [10M]  
 b) Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet. [5M]



- 9 a) What is specific speed? State its significance in the study of hydraulic turbine. [5M]
- b) A Kaplan turbine develops 25000 kW power at an average head of 50 meter . [10M]  
assuming a speed ratio of 2, flow ratio of 0.6, diameter of the boss equal to 0.4  
times the diameter of the runner and an overall efficiency of 89% , calculate the  
diameter, speed and specific speed of specific speed of the turbine.

Or

- 10 a) Discuss the relative merits and demerits of reciprocating pump against centrifugal pump. [7M]
- b) A centrifugal pump delivers water against a net head of 15m and design speed of 1200 rpm. The vanes are curved back to an angle of  $30^\circ$  with periphery. The impeller diameter is 300 mm and outlet width 50 mm. Determine the discharge of the pump if the manometric efficiency is 95%. [8M]

