

B.Tech II Year II Semester (R09) Supplementary Examinations December/January 2014/2015

**HYDRAULICS & HYDRAULIC MACHINERY**

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

Answer any FIVE questions  
All questions carry equal marks

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- 1 (a) Derive the equation for critical depth in terms of alternate depths.  
(b) A trapezoidal channel of the most economical section has a wetted perimeter of 16 m and depth of flow of 1 m. If the velocity is 1.5 m/s, what is the discharge?
- 2 (a) Write short note on integration method of solving GVF equation.  
(b) A rectangular channel carries a discharge of 3 cumecs per m width. If the loss of energy in the hydraulic jump is found to be 3.2 m, determine the conjugate depths before and after the jump.
- 3 (a) Explain the significance of dimensional analysis as applied to fluid flow problems.  
(b) A small sphere of density  $\rho$ , and diameter  $D$  settles at a terminal velocity  $V$  in a liquid of density  $\rho_f$  and dynamic viscosity  $\mu$ . Gravity  $g$  is known to be a parameter. Express the functional relationships between these variables in a dimensionless form.
- 4 (a) Derive the equation for the force of impact of a fluid jet on a normal flat vane moving in the direction of jet and the vane velocity is less than jet velocity.  
(b) A horizontal jet of water of 5 cm diameter and velocity 40 m/s is deflected through an angle of  $135^\circ$  by a stationary curved vane. Assuming shockless and frictionless flow, determine the magnitude and direction of the resultant force on the vane.
- 5 (a) Differentiate between reaction turbines and hydraulic turbines.  
(b) How is the Kaplan turbine governed? Explain with a neat diagram.
- 6 (a) What are the requirements of a governor in hydropower Installation? Explain.  
(b) What is the necessity of governing the turbines?  
(c) How do you say that geometrically similar velocity triangles assure kinematic similarity?
- 7 (a) Describe with a sketch, the installation and operation of a centrifugal pump.  
(b) List out the difficulties that are generally encountered in operating centrifugal pumps.
- 8 (a) Write short on:  
(i) Necessity of storage and pondage.  
(ii) Stream flow data requirement in hydropower plants.  
(b) The average annual yield of a river at a dam site is  $2 \times 10^4 \text{ ha} - \text{m}$ . Assuming the entire yield is available for power generation, estimate the water power potential and the available energy. The average net head is 100 m. Take overall efficiency as 90%.

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