Code: 9A01402

R09

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 ρ, and diameter D settles at a terminal velocity V in a liquid of density ρ_f and dynamic viscosity μ. 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° 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 $2 \times 10^4 \, ha - m$. 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%.