

B. E / B. Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS NOV/DEC 2011  
CIVIL and AGRICULTURAL AND IRRIGATION ENGINEERING  
FOURTH SEMESTER  
**CE 9253 APPLIED HYDRAULIC ENGINEERING**

(REGULATION 2008)

TIME: 3 hr

Max Mark: 100

Answer ALL questions

PART – A (10 x 2 = 20 MARKS)

1. Differentiate mobile boundary and rigid boundary channels
2. What are the equations available to find the roughness coefficients?
3. List the assumptions in deriving the dynamic equation of GVF
4. Draw and define the specific energy curve with salient features
5. A stationary hydraulic jump occurs in a rectangular channel with the initial and sequent depths being equal to 0.20 m and 1.20 m respectively. Estimate the discharge per unit width.
6. Write the Lagrange's celerity equation and explain the parameters?
7. State the reasons for providing a draft tube in reaction turbines.
8. Define Manometric efficiency in centrifugal pump
9. List the purposes of providing air vessels in reciprocating pump
10. What are the factors that influence the speed of the pump?

PART – B (5 x 16 = 80 Marks)

11. a. i Water flows in a channel of the shape of isosceles triangle of bed width 'a' and sides making an angle of 45 degree with the bed. Determine the relations between depth of flow 'd' and bed width 'a' for maximum velocity condition and for maximum discharge condition. Use Manning's formula and note that 'd' is less than 0.5 a. (16)
12. a. i With the help of a diagram discuss the surface profile variations in a mild, steep and critical sloped channels considering the given depth lies in all the zones of the respective channels. (16)

OR

12. b.i A rectangular channel of 8m wide carries a discharge of 25 m<sup>3</sup>/s. The longitudinal slope is 0.0001. If at a section in this channel the depth is 1.8 m, how far upstream or downstream from the section will the depth be 2.2 m? Take Manning's n as 0.015. (16)

- 13 a.i Derive the Belangar equation relating depths of hydraulic jump to Froude's number (12)
- a.ii Discuss the various types of hydraulic jump with a neat diagrams (4)

OR

13. b.i A gate is to be suddenly dropped into place closing a rectangular channel 2m deep and 3m wide in which  $6 \text{ m}^3/\text{s}$  of water is flowing at a depth of 1.2m. Will the water spill over the sides? What will be the velocity and height of the surge produced? (16)

14. a. i Derive an expression for the minimum starting speed of the centrifugal pump (8)
- a. ii Explain the components and working principle of a centrifugal pump (8)

OR

14. b. i Explain the differences between impulse and reaction turbine (4)
- b ii A pelton wheel turbine has a mean bucket speed of 12 m/s with a jet of water flowing at the rate of 950 l/s under a head of 40 m. The buckets deflect the jet at an angle of 165 degrees. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity to be 0.96 (12)

15. a. i A single acting reciprocating pump has a plunger of 0.06 m diameter and a stroke length of 0.12m. It takes its supply of water from a sump 3m below the pump through a pipe 4 m long and 0.04 m in diameter. It delivers water to a tank 10 m above the pump through a pipe 0.025 m in diameter and 15 m long. If separation occurs at 0.75 bars below the atm pressure, find the maximum speed at which pump may be operated without separation. Assume that the plunger has a simple harmonic motion. (16)

OR

15. b.i Derive an expression for head lost due to friction in the delivery pipe of a reciprocating pump, with and without air vessel. (10)
- b.ii Explain the working of any one of the rotary pumps with a neat diagram (6)