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B. E / B. Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS APRIL / MAY 2011

AGRICULTURAL AND IRRIGATION ENGINEERING BRANCH

FOURTH SEMESTER – (REGULATION 2004)

CE 283 APPLIED HYDRAULIC ENGINEERING

TIME: 3 hr Max Mark: 100

Answer ALL questions

PART – A (10 x 2 = 20 MARKS)

1. State the conditions for considering trapezoidal section as the best economical section
2. For a triangular channel having a vertex angle of 120°, calculate the critical depth for a discharge of 4 m^3/s at a depth of 'y' m
3. Differentiate hydraulic mean depth and hydraulic depth
4. Sketch the zones for water surface profile in a critical sloped channel
5. What is meant by negative surge?
6. A sluice gate discharges water into horizontal rectangular channel with a velocity of 10 m/s and depth of flow of 1m. Determine the depth of flow of water after the jump and consequent loss in total head.
7. Define the term NPSH
8. How does the specific speed of the turbine differ from that of a centrifugal pump?
9. Under what conditions negative slip occurs?
10. What is the use of air vessel in a single acting reciprocating pump?

PART – B (5 x 16 = 80 Marks)

11. a. i A trapezoidal channel has side slopes 1 to 1. It is required to discharge 13.75 m^3/s of water with a bed gradient of 1in 1000. If unlined the value of Chezy's C is 44. If lined its value is 60. The cost per m^3 of excavation is four times the cost per m^2 of lining. The channel is to be the most efficient one. Find whether the lined canal or the unlined canal will be cheaper. What will be the dimension of that economical canal? (16)

12. a. i A rectangular channel 12 m wide carries a discharge of 35 m^3/s. It is laid at a slope of 0.0001. If at a section in this channel the depth is 1.6m, how far (upstream or downstream) from the section will the depth be 2.0 m? Take Manning's n as 0.015. (16)

OR

12. b.i With the help of a diagram discuss the surface profile variations in a mild and steep sloped channels considering the given depth lies in all the zones of the respective channels. (16)

13 a.i A horizontal rectangular channel of 3m width and 2m water depth conveys water at 18 m^3/s. If the flow rate is suddenly reduced to 2/3 of its original value, compute

the magnitude and speed of the upstream surge. Assume that the front of the surge is rectangular and friction in the channel is neglected. (10)

a.ii Discuss the various types of hydraulic jump with a neat diagrams (6)

OR

13. b.i Derive an expression for sequent depth in terms of Froude number and loss of energy due to hydraulic jump. (16)

14. a. i A centrifugal pump has an impeller of internal diameter 0.12 m and external diameter 0.24m, which rotates at 1200 rpm. The absolute velocity of water at inlet is radial and vanes are curved back at an angle of 25 degree to the tangent at outlet. The width of the impeller at inlet and outlet is 0.016m and 0.008 m, respectively. Determine the gain of pressure head as water passes through the impeller, neglecting losses. The pump discharges water at the rate of 500 l/min. (16)

OR

14. b. i Write short notes on the characteristic curves of centrifugal pump (4)

b.ii A inward flow turbine (reaction turbine with radial discharge) with an overall efficiency of 80% is required to develop 150 kW. The head is 8m, peripheral velocity of wheel is 0.96 $(2gh)^{1/2}$, the radial velocity of the flow is 0.36 $(2gh)^{1/2}$. The wheel is to make 160 rpm and the hydraulic losses in the turbine are 24% of the available energy. Determine the angle of the guide blade angle, wheel vane at inlet, the diameter and width of the wheel at inlet. (12)

15. a. i Derive an expression for acceleration head during suction and delivery stroke of a single acting reciprocating pump and indicate the effect of acceleration in the indicator diagram. (16)

OR

15. b.i Explain the working of a single acting reciprocating pump and derive an expression for the work done. (10)

b.ii Explain the principle behind the working of a rotary pump (6)