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B. E / B. Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS MAY 2012

CIVIL ENGINEERING BRANCH

FOURTH SEMESTER

CE 283 APPLIED HYDRAULIC ENGINEERING

(REGULATION 2004)

TIME: 3 hr Max Mark: 100

Answer ALL questions

PART – A (10 x 2 = 20 MARKS)

1. Differentiate open channel flow and pipe flow
2. Define specific energy and specific force.
3. List the assumptions involved in deriving the dynamic equations of GVF
4. When a channel is said be critical sloped channel?
5. Write the applications of hydraulic jump
6. What is meant by surge and what are the types?
7. Differentiate impulse and reaction turbines and give examples.
8. Define NPSH
9. When negative slip occurs and what re its consequences?
10. What is an ideal indicator diagram?

PART – B (5 x 16 = 80 Marks)

11. a. i Derive an expression for the best slope for most economical trapezoidal section and also deduce the relationship between wetted perimeter and width for the best slope (16)

12. a. i A rectangular channel 16 m wide carries a discharge of 40 m^3/s. It is laid at a slope of 0.0001. If at a section in this channel the depth is 2.0 m, how far (upstream or downstream) from the section will the depth be 2.6 m? Take Manning's n as 0.016. (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 Show that the head loss in a hydraulic jump formed in a rectangular channel may be expressed as $E = \frac{(V_1 - V_2)^3}{2g(V_1+V_2)}$ (16)

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13. b.i A Wide rectangular channel has a Manning's coefficient of 0.018. For a discharge intensity of $1.5m^3/s/m$, Identify the possible types of GVF profile produced in the break in the grade of the channel S_o= 0.0004 to S_0=0.016 (16)

14. a. i A Pelton wheel has to develop 18,000 bhp under a net head of 800m while running at a speed of 600 rpm. If the coefficient of the jet C_v =0.97, speed ratio =0.46 and the ratio of the jet diameter is 1/16 of the wheel diameter, calculate the number of jets required for the pelton wheel. Calculate also the diameter of jets, the pitch diameter and the quantity of water supplied to the wheel. Assume overall efficiency as 85% (12)

a.ii Derive an expression for the minimum starting speed of the centrifugal pump (4)

OR

14. b. i 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)

b ii Write short notes on the characteristic curves of centrifugal pump (4)

15. a. i Find the maximum speed of a single acting RP to avoid separation, which occurs at 3m (abs). Pump diameter 10cm, stroke 20cm. The pump draws water from a sump and delivers to a tank. The water level in the sump is 3.5m below the pump axis and in the tank the water level is 13m below the pump axis. The diameter and length of suction pipe are 4cm and 5m while of delivery pipe the diameter and length are 3cm, 20m respectively. Take atmospheric pressure head =10.3 m of water. (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. (16)