11/10/13

Roll.No								

B. E / B. Tech. (Full Time) DEGREE END SEMESTER EXAMINATIONS Nov/Dec 2013

CIVIL ENGINEERING

FOURTH SEMESTER

CE 283 / CE 9253 APPLIED HYDRAULIC ENGINEERING

(REGULATION 2004/2008)

TIME: 3 hr Max Mark: 100

Answer ALL questions

PART – A (10 x 2 = 20 MARKS)

1. Define open channel flow with examples.
2. What are the conditions for a best rectangular channel?
3. List the assumptions involved in deriving the dynamic equation of the GVF.
4. Under which circumstances M_2 and S_2 Profile will occur in open channels?
5. A 4 m wide rectangular channel conveys 10 m^3/s of water with a velocity of 4 m/s. Is there a condition for hydraulic jump to occur?
6. What is meant by surge and what are the types?
7. Differentiate impulse and reaction turbine. Give examples.
8. What is meant by Net Positive Suction Head?
9. How a single acting reciprocating pump is different from double acting reciprocating pump?
10. Define the term cavitation?

PART – B (5 x 16 = 80 Marks)

11. a. i Show that the head loss in a hydraulic jump formed in a rectangular channel may be expressed as $E = \dfrac{(V_1-V_2)^3}{2g\,(V_1+V_2)}$ (8)

a.ii Derive the conditions for most economical trapezoidal section (8)

12. a. i Derive the dynamic equation of the Gradually Varied Flow (10)

a.ii Briefly explain the procedure for flow profile determination using direct step method (6)

OR

12. b.i Explain in detail, the classification and the characteristics of surface profiles in open channels (16)

13. a.i Derive an expression for estimation of sequent depths of a hydraulic jump and also list the applications of hydraulic jump (10)

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

Roll.No								

OR

13. b.i A horizontal rectangular channel of 3m width and 2m water depth conveys water at 20 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. (16)

14. a. i The following data is given for a Francis Turbine. Net head H= 60m; speed =700 rpm; shaft power = 293 kw; η_o=84%; flow ratio =0.20; breadth ratio n=0.1; outer diameter of the runner = 2 x inner diameter of the runner. The thickness of vanes occupies 5% of circumferential area of the runner, velocity of flow is constant at inlet and outlet and discharge is radial at outlet. Determine Guide blade angle, diameters of runner at inlet and outlet, runner vane angle at inlet and outlet and width of the wheel at inlet. (16)

OR

14. b. i Explain the functions of various components of Pelton turbine with neat sketches (6)

b. ii Derive an expression for minimum speed for starting a centrifugal pump (10)

15. a. i Determine the maximum speed at which a double acting reciprocating pump can be operated under the following conditions (a) no air vessel on the suction side (b) very large air vessel on the suction side close to the pump. The suction lift is 4m, length of suction pipe 6.5 m, diameter of suction pipe 100 mm, diameter of piston 150mm and length of stroke is 0.45m. Assume SHM, separation would occur at 2.6 m of water absolute. Take Darcy's f =0.024. (16)

OR

15. b.i Derive an expression for the acceleration head in a single acting reciprocating pump and how it is shown in the indicator diagram (16)