C 3107

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Fourth Semester

(Regulation 2004)

Civil Engineering

CE 1253 — APPLIED HYDRAULIC ENGINEERING

(Common to B.E. (Part-Time) Third Semester - Regulation 2005)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 – 20 marks)

1. What is specific Energy and what is the condition for getting only one depth for a given specific energy?

2. Differentiate Closed conduit flow and open channel flow

3. Define economical cross section and list the condition for a trapezoidal channel?

4. What are the equipments used to measure velocity in an open channel?

5. What are the Possible profile in a Mild sloped open channel?

6. What is Hydraulic jump in horizontal bed channel?

7. Differentiate Laminar flow and Turbulent flow?

8. What are the classification of turbine and give suitable example?

9. What is negative slip in reciprocating turbine?

10. What is positive displacement pump and roto dynamic pump?

PART B — (5 × 16 = 80 marks)

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11. (a) A trapezoidal channel has a bottom width 6 m and side slope of 2 horizontal to 1 vertical. If the depth of flow is 1.2 m at a discharge of 10 m³/s. Compute the specific energy and critical depth. (16)

Or

(b) (i) Define Wide open channel and also what are the important assumption in hydraulic parameters? (5)

(ii) The rectangular channel carries a discharge of 30 m³/s. The bottom width of the channel is 6.0 m and flow velocity is 1.75 m/s. Determine two alternate depth possible in the channel. (11)

12. (a) (i) Define Uniform flow in open channel and write Chezy's equation?

(4)

(ii) A trapezoidal channel bottom width 3 m, side slope 1.5 H : 1 V carries discharge of 10 m³/s at a depth of 1.5 m under uniform flow condition. The longitudinal slope of the channel is 0.001. Compute the Manning's Roughness Coefficient for the channel. (12)

Or

(b) A Circular pipe diameter 600 mm carries discharge 0.2 m³/s will flow half full. Determine the slope of the pipe to be laid in the ground. Assume Manning's n = 0.013 for concrete pipe. Also determine the depth of flow if the pipe is laid in a slope of 0.01. (16)

13. (a) A rectangular channel of width 5 m. flows 1.5 m in uniform flow. Bed slope of the channel is 0.005. The uniform flow is blocked by a weir and flow depth of 4 m from bed of the channel. Determine the length of the Back water profile between 4 m to 2 m. Use direct step method and assume Manning's n as 0.015. (16)

Or

(b) (i) Define Gradually varied and Rapidly Varied flow in open channel? (4)

(ii) Derive the relation between sequent depths in open channel? (12)

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14. (a) (i) What is the main advantage of fitting Draft tube in Francis turbine? (3)

(ii) The velocity of whirl at inlet to the runner of an inward flow reaction turbine is 3.15 $\sqrt{H}$ m/s and the velocity of flow at inlet is 1.05 $\sqrt{H}$ m/s. The velocity of whirl at exit is 0.22 $\sqrt{H}$ m/s in the same direction as at inlet and the velocity of flow at exit is 0.83 $\sqrt{H}$ m/s, where H is head of water 30 m. The inner diameter of the runner is 0.6 times the outer diameter. Assuming hydraulic efficiency of 80%. Compute angles of the runner vanes at inlet and exit. (13)

Or

(b) A Impulse wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 1.0 m³/s under a head of 50 m. The buckets deflects the jet through an angle of 165 degree. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as 0.99. (16)

15. (a) The centrifugal pump has the following characteristics. Outer diameter of impeller = 800 mm; width of the impeller vane at outlet = 100 mm; angle of the impeller vanes at outlet = 40 degree. The impeller runs at 550 rpm and delivers 0.98 m³/s under an effective head of 35 m. A 500 kW motor is used to drive the pump. Determine the manometric, mechanical and overall efficiencies of the pump. Assume water enters the impeller vanes radially at inlet (16)

Or

(b) A single acting Reciprocating pump discharges 4.5 litres per second with cylinder bore diameter 200 mm. and its stroke length 300 mm. The pump runs at 350 rpm and lifts water through a height of 25 m. The delivery pipe is 30 m long and 100 mm. in diameter. Find the theoretical discharge and the theoretical power required to run the pump also determine the percentage slip. (16)