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Question Paper Code : 60250

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Civil Engineering

CE 2253/CE 44/CE 1253 A/080100020/10111 CE 404 — APPLIED HYDRAULICS ENGINEERING

(Regulations 2008/2010)

(Common to PTCE 2253/10111 CE 404 – Applied Hydraulics Engineering for B.E. (Part-Time) Fourth Semester – Civil Engineering – Regulations 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between laminar flow and turbulent flow in open channels.
2. Define specific energy.
3. Define normal depth.
4. What is the condition for maximum velocity of flow in circular channel?
5. Distinguish between positive and negative surges.
6. What are the uses in the formation of hydraulic jump?
7. What is the theoretical discharge in double acting reciprocating pump?
8. What are the advantages of fitting air vessel in reciprocating pumps?
9. What is the force exerted on stationary flat plate held normal to the jet?
10. What are the uses of turbines?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain briefly the salient features of specific energy curve. (8)

(ii) A rectangular channel of bed width 2.5 m has a specific energy of 1.6 m when carrying a discharge of 6.6 cumecs. Determine the alternate depths and the corresponding Froude numbers. (8)

Or

(b) (i) Determine the bed width of a trapezoidal channel required to carry a discharge of 15 m^3/s as critical flow at a depth of 1.2 m. The side slope of the channel is 1½ : 1. (6)

(ii) A 2.5 m wide rectangular channel carries a discharge of 6 m^3/s at a depth of 0.50 m. Determine the minimum height of a streamlined, flat-topped hump required to be placed at a section to cause critical flow over the hump. Assume that the energy loss over the hump is 10% of the upstream velocity head. (10)

12. (a) (i) Derive Chezy's equation. (8)

(ii) The bed width of a trapezoidal channel is 10 m and the side slope is 1½ : 1. The bed slope of the channel is 3 in 10000. The channel is lined with concrete and Manning's n = 0.012. Determine the velocity of flow and discharge in the channel. Assume most economical section. (8)

Or

(b) A concrete lined circular channel of 3 m diameter has a slope of 1 in 1000. Assume Chezy's constant C = 50. Determine the velocity and the rate of flow in the channel when :

(i) The velocity of flow is maximum (8)

(ii) The discharge is maximum. (8)

13. (a) (i) State the assumptions in derivation of dynamic equation for gradually varied flow. (6)

(ii) Derive the dynamic equation for gradually varied flow. (10)

Or

(b) (i) How do you classify hydraulic jumps? (6)

(ii) A hydraulic jump occurs in a rectangular channel with sequent depths of 0.25 m and 1.50 m at the beginning and end of the jump respectively. Determine :

(1) The discharge per unit width

(2) Energy loss. (10)

14. (a) (i) Explain briefly the working principle of Jet pump with a neat sketch. (8)

(ii) The inlet and outlet diameters of the impeller of a centrifugal pump are 25 cm and 50 cm respectively. The velocity of flow at outlet is 2.5 m/sec and the vanes are set back at angle of 45° at the outlet. Determine the minimum starting speed if the manometric efficiency is 0.8. (8)

Or

(b) (i) Determine the percentage of savings in work done by fitting an air vessel in double acting reciprocating pump. (8)

(ii) A single acting Reciprocating pump running at 60 rpm delivers 8.83 l.p.s. water per minute. The diameter of the piston is 200 mm and stroke length 300 mm. The suction and delivery heads are 4 m and 12 m respectively. Determine :

(1) Theoretical discharge

(2) Co-efficient of Discharge

(3) Percentage slip of the pump, and

(4) Power required to run the pump. (8)

15. (a) (i) What are the various types of draft tubes? (6)

(ii) A jet of water of 75 mm diameter strikes a curved vane with a velocity of 20 m/s. The curved vane is moving with a velocity of 8 m/s in the direction of the jet. Determine :

(1) The force exerted on the plate

(2) Power of the jet

(3) The efficiency of the jet. (10)

Or

(b) A Francis turbine works under a head of 25 m producing 3675 kW at 150 r.p.m. Determine :

(i) The unit power

(ii) Unit speed

(iii) Specific speed

(iv) Power developed in the turbine when the speed is reduced to 100 r.p.m. (16)
