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P 1102

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2007.

Fourth Semester

Civil Engineering

CE 238 — APPLIED HYDRAULIC ENGINEERING

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is a Prismatic Channel?
2. Define the term : Specific energy of a flowing liquid.
3. What is meant by an economical section of a channel?
4. Write down any two formula for determining the Chezy's constant.
5. Distinguish between Gradually varied flow and Rapidly varied flow.
6. Explain "Back Water Curve".
7. What are the assumptions involved in deriving the hydraulic jump?
8. What is Cavitation? What are its effects?
9. What is Priming? Why it is necessary?
10. Define Indicator Diagram.

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the different types of flow in channels? Explain with an example. (6)
- (ii) Explain the velocity distribution in a rectangular, trapezoidal, triangular and circular section with neat sketch. (10)

Or

- (b) (i) What is specific energy curve? Draw the specific energy curve and derive the expression for critical depth and critical velocity. (10)
- (ii) Find the critical depth and critical velocity of water flowing through a rectangular channel of width 5 m, when discharge is 1.5 m³/s. (6)
12. (a) A trapezoidal channel to carry 142 m³/minute of water is designed to have a minimum cross-section. Find the bottom width and length of the bed slope is 1 in 1200, the side slope @ 45° and Chezy's constant = 55.

Or

- (b) (i) Derive the condition for most economical section of a rectangular channel. (6)
- (ii) Determine the maximum discharge of water through a circular channel of diameter 1.5 m, when the bed slope of the channel is 1 in 1000. Take C = 60. (10)
13. (a) A rectangular channel of 10 m width carries a discharge of 30 m³/s. It is laid at a slope of 0.0001. If at a section in this channel, the depth is 1.6 m, how far (u/s and d/s) from the section will the depth be 2.0 m? Take Mannings n as 0.015.

Or

- (b) (i) Explain the step method of integrating the varied flow equation for the channel section. (8)
- (ii) What are the characteristics of surface profiles in horizontal channels? (8)
14. (a) (i) Explain the term 'Hydraulic jump'. Derive an expression for loss of energy due to Hydraulic jump. (8)
- (ii) The depth of flow of water at a certain section of a rectangular channel of 2 m wide is 0.3 m. The discharge through a channel is 1.5 m³/sec. Determine whether a hydraulic jump will occur, if so, find its height and loss of energy per kg. of water. (8)

Or

- (b) (i) How will you classify turbines? Give examples and what is the basis of selection of a turbine at a particular place. (8)
- (ii) What is a draft tube? Why is it used in a reaction turbine? (4)
- (iii) What is cavitation? How can it be avoided in reaction turbine? (4)
15. (a) A centrifugal pump having a outer diameter equal to two times the inner diameter and running at 1000 r.p.m. works against a total head of 40 m. The velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 50 mm and width at outlet is 50 mm, determine
- (i) Vane angle at inlet,
- (ii) Workdone by impeller on water per second and
- (iii) Manometric efficiency.

Or

- (b) (i) What is a reciprocating pump? Describe the principle and working of a single acting reciprocating pump. (8)
- (ii) A single-acting reciprocating pump running at 30 r.p.m., delivers $0.012 \text{ m}^3/\text{s}$ of water. The diameter of the piston is 25 cm and stroke length 50 cm. Determine
- (1) The theoretical discharge of the pump
- (2) Coefficient of discharge
- (3) Slip and percentage slip of the pump. (8)
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