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Question Paper Code : 90325

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022.

Fourth Semester

Civil Engineering

CE 8403 — APPLIED HYDRAULIC ENGINEERING

(Regulations 2017)

Time : Three hours Maximum : 100 marks

1. Missing data if any may suitably be assumed
2. Draw sketches whenever necessary.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Difference between laminar flow and turblent flow.
2. Mention the condition for best hydraulic section for a rectangular channel.
3. Define 'critical flow'.
4. What is called 'afflux' in gradually varied flow?
5. Define Froude's number and Euler's number
6. Mention the cause for a 'Hydraulic Jump'.
7. Differentiate impulse and reaction turbines.
8. Draw a simple sketch of a pelton wheel.
9. What is meant by Negative slip?
10. State the purpose of an Air vessel in a pump.

PART B — (5 × 13 = 65 marks)

11. (a) The discharge of water through a rectangular channel of width 8m, is 15 m^3/sec. when the depth of flow is 1.2m, calculate

(i) Specific Energy of flowing water (5)

(ii) Critical depth and critical velocity (4)

(iii) Minimum Specific Energy (4)

Or

(b) Derive a relation for Chezy's equation for a Uniform flow. (13)

12. (a) Determine the length of the backwater curve caused by an afflux of 2.0 m in a rectangular section of width 40 m and depth 2.5 m. The slope of the bed is given as 1 in 11000.

Take Manning's N = 0.03 (13)

Or

(b) (i) State the various assumptions to be made while deriving equations for a gradually varied flow. (7)

(ii) How drop down curve can be obtained? Explain with equations. (6)

13. (a) Derive an expression for the length of Hydraulic jump under rapidly varied flow conditions. (13)

Or

(b) A sluice gate discharges water into a horizontal rectangular channel with a velocity of 10m/s and depth of flow of 1 m. Determine the depth of flow after the jump and consequent loss in total head. (13)

14. (a) A Kaplan Turbine develops 24000 kW power at an average head of 39 m. By assuming a speed ratio of 2, flow ratio of 0.6, diameter of the boss equal to 0.35 times the diameter of the runner and an overall efficiency of 90 %. Calculate the diameter, speed and specific speed of the turbine. (13)

Or

(b) Explain the working of reaction trubine along with its components with a neat sketch. (13)

15. (a) A centrifugal pump having an outer diameter equal to two times the inner diameter and running at 1000 rpm. works against a total head of 40m. 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 500mm and the width at outlet is 50 mm, determine:

(i) Vane angle at outlet (5)

(ii) Work done by impeller on water per second (4)

(iii) Manometric Efficiency (4)

Or

(b) (i) Explain the working mechanism of a reciprocating pump with a neat sketch. (7)

(ii) Bring out the effect of acceleration in suction and delivery pipes on indicator diagram. (6)

PART C — (1 × 15 = 15 marks)

16. (a) Elaborate on the following:

(i) Conditions for a most economical section for a trapezoidal channel (6)

(ii) Characteristic curves for turbines (9)

Or

(b) (i) A rectangular channel of width 4 m is having a bed slope of 1 in 1500. Find the maximum discharge through the channel. Take value of C = 50. (6)

(ii) Explain the conditions for super critical and sub critical flow (9)

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