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B.TECH. DEGREE EXAMINATION, MAY 2016

Fourth Semester

Branch : Civil Engineering

CE 010 404—OPEN CHANNEL FLOW AND HYDRAULIC MACHINES (CE)

(New Scheme—2010 Admission onwards)

[Regular/Improvement/Supplementary]

Maximum : 100 Marks

Time : Three Hours

Part A

Answer all questions.
Each question carries 3 marks.

1. When a flow is said to be uniform ? Write the Mathematical equation for the flow.

2. Explain the method of measurement of discharge in rivers by area-velocity-method.

3. Explain the term hydraulic jump with sketch.

4. Write a note on draft tube.

5. Explain cavitation in pumps.
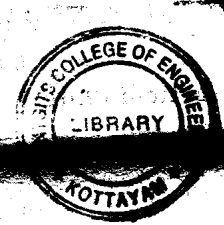
(5 × 3 = 15 marks)

Part B

Answer all questions.
Each question carries 5 marks.

6. Derive the condition for the test side slope of the most economical trapezoidal channel.

7. Brief backwater computation by direct step method.

8. Explain gauges and recorders for stream flow measurement.

9. Differentiate impulse and reaction turbines.

10. Sketch a centrifugal pump with main parts.

(5 × 5 = 25 marks)

Part C

Answer all questions.
Each full question carries 12 marks.

11. Find the velocity of flow and rate of flow of water through a rectangular channel of 6 m. wide and 3 m. deep, when it is running full. The channel is having bed slope as 1 in 2000. Take Chezy's constant C = 55.

Or

Turn over

12. Explain the terms :

    (a) Specific energy.

    (b) Specific force.

13. Derive the differential equation for steady gradually varied flow in open channels.

Or

14. Find the slope of the free water surface in a rectangular channel of width 20 m., having depth of flow 5 m. The discharge through the channel is 50 m^3/s. The bed of the channel is having a slope of 1 in 4000. Take Chezys constant C = 60,

15. In a hydraulic jump occurring in a horizontal rectangular channel the Froude number before the jump is 10, and the energy loss in the jump is 3.2 m. (i) Estimate is sequent depth ; (ii) Discharge intensity ; (iii) Froude number after the jump.

Or

16. The depth of flow of water of a certain section of a rectangular channel of 4 m. wide, is 0.5 m. The discharge through the channel is 16 m^3/s. If the hydraulic jump takes place on the downstream side, find the depth of flow after the jump.

17. Prove that the force exerted by a jet of water on a fixed semi-circular plate in the direction of the jet when the jet strikes at the centre of the semi-circular plate is two times the force exerted by the jet on a fixed vertical plate.

Or

18. Neatly sketch the hydro-electric power plant layout and discuss various efficiencies of hydraulic turbine.

19. A centrifugal pump is to discharge 0.118 m^3/s at a speed of 1450 r.p.m. against a head of 25 m. The impeller has a diameter 250 mm. and its width at outlet is 50 mm. and manometric efficiency is 75 %. Determine the vane angle at the outer periphery of the impeller.

Or

20. A double acting reciprocating pump, running at 40 r.p.m. is discharging 1.0 m^3 of water per minute. The jump has a stroke of 400 mm. The diameter of the piston is 200 mm. The delivery and suction head are 20 m. and 5 m. respectively. Find the slip of the pump and power required to drive the pump.

(5 × 12 = 60 marks)