

Reg. No. :

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B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Fourth Semester

Civil Engineering

CE 6403 — APPLIED HYDRAULIC ENGINEERING

(Regulation 2013)

(Common to PTCE 6403 — Applied Hydraulic Engineering for B.E. (Part-Time) for
Fourth Semester — Civil Engineering — Regulation 2014)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define sub-critical, critical and super critical flow.
2. Define critical depth.
3. Distinguish between drawdown and backwater curves.
4. List the methods to determine the length of surface profile in GVF.
5. Define energy dissipation.
6. What are the uses of hydraulic jump?
7. What is radial flow turbine?
8. What is the purpose of providing a casing in turbine?
9. Define negative slip.
10. What is an indicator diagram?

PART B — (5 × 13 = 65 marks)

11. (a) Derive the Chezy's formula for discharge through channel. Write the formulae to find out the constant C.

Or

- (b) Derive the geometrical properties of a most economical triangular channel section.
12. (a) Explain the features of water surface flow profile classifications.

Or

- (b) Explain the direct step method and standard step method of obtaining numerical solution to GVF problems.
13. (a) Define surges. What are its types? How the energy dissipated? Explain in detail.

Or

- (b) At the bottom of a spillway the velocity and depth of flow are 9 m/s and 1.2 m respectively. If the tail water depth is 5.1 m, find the location of the jump with respect to the toe of the spillway. What should be the length of the apron to contain this jump? Assume the apron to be horizontal and Manning's $n = 0.012$.

14. (a) (i) Distinguish between impulse and reaction turbines. (7)
- (ii) Define the following for a turbine : (3 × 2 = 6)
- (1) Manometric Efficiency
 - (2) Volumetric Efficiency
 - (3) Mechanical Efficiency.

Or

- (b) A Pelton wheel is required to develop 8575 kW when working under the head of 250 m. The speed of the Pelton wheel is 500 rpm. The co-efficient of velocity is 0.98 and the speed ratio is 0.46. Assuming jet ratio as 10 and overall efficiency as 82%, determine:
- (i) the number of jets
 - (ii) the diameter of the wheel
 - (iii) the quantity of water required.

15. (a) (i) A single acting reciprocating pump has a plunger diameter of 250 mm and stroke length of 330 mm. The speed of the pump is 100 rpm and the discharge is $0.025 \text{ m}^3/\text{sec}$ of water. Determine: (6)
- (1) The theoretical discharge,
 - (2) Co-efficient of discharge,
 - (3) Percentage of slip.
- (ii) Explain in detail about the working of air vessel. (7)

Or

- (b) A centrifugal pump has a suction lift of 1.5 m and the delivery tank is 13.5 m above the pump. The velocity of water in the delivery pipe is 1.5 m/s. The radial velocity of flow through the wheel is 3 m/s and the tangent to the vane at exit from the wheel makes an angle of 120° with the direction of motion. Assuming that the water enters radially and neglecting friction and other losses, determine:
- (i) Velocity of wheel at exit.
 - (ii) Velocity and pressure head at exit from the wheel and
 - (iii) Direction of fixed guide vanes.

PART C — (1 × 15 = 15 marks)

16. (a) In a flow through a rectangular channel for a certain discharge if the Froude's number corresponding to two alternate depths are F_1 and F_2 . Show that $(F_2 / F_1) = (2 + F_2^2) / (2 + F_1^2)$.

Or

- (b) Compare the centrifugal pump with reciprocating pump.