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**Question Paper Code : 90123**

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fourth Semester

Civil Engineering

CE 8403 – APPLIED HYDRAULIC ENGINEERING

(Regulations 2017)

Time : Three Hours

Maximum : 100 Marks

Missing data if any may suitably be assumed.

Draw sketches whenever necessary.

Answer ALL questions.

PART – A

(10×2=20 Marks)

1. Difference between pipe flow and open channel flow.
2. State 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.
6. What is called 'Hydraulic Jump' ?
7. Give examples for Reaction Turbine.
8. What is meant by draft tube ? Why it used ?
9. Define Slip of a reciprocating pump.
10. What is an air vessel ? State its functions.



## PART – B

(5×13=65 Marks)

11. a) The discharge of water through a rectangular channel of width 10 m, is  $25\text{m}^3/\text{sec}$ . When the depth of flow is 2m, calculate :
- Specific Energy of flowing water. (5)
  - Critical depth and critical velocity. (4)
  - 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 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)
- State the various assumptions to be made while deriving the dynamic equation of gradually varied flow. (7)
  - Explain the characteristics of  $M_2$  and  $S_2$  profiles (drawdown curve) with neat sketches. (6)
13. a) Obtain an expression for the sequent depth and 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 10 m/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 diameters, speed and specific speed of the turbine. (13)
- (OR)
- Explain the working of Pelton wheel along with its components with a neat sketch. (5)
  - Derive an expression for determining the maximum hydraulic efficiency of a Pelton wheel. (8)



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 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  $40^\circ$  at outlet. If the outer diameter of the impeller is 500 mm and the width at outlet is 50 mm, determine :
- Vane angle at outlet. (5)
  - Work done by impeller on water per second. (4)
  - Manometric Efficiency. (4)
- (OR)
- What is a jet pump? Explain the working mechanism of a jet pump with a neat sketch. (8)
  - Bring out the effect of acceleration in suction and delivery pipes on indicator diagram. (5)

## PART – C

(1×15=15 Marks)

16. a) Write a brief note on the following :
- Steady flow and Unsteady flow (4)
  - Laminar Flow and Turbulent flow (4)
  - Characteristic curves for turbines (7)
- (OR)
- 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)
  - Derive the conditions for a most economical section for a trapezoidal channel. (9)