

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2024

Fourth Semester

Civil Engineering

20CEPC401 - APLLIED HYDRAULIC ENGINEERING

(Regulations – 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

	Marks	K- Level	CO
1. Define Open Channel with example.	2	K1	CO1
2. Compare Uniform flow and Non-Uniform flow.	2	K2	CO1
3. Give a brief note on Sub -Critical, Critical and Super critical flow.	2	K2	CO2
4. What is specific energy and is the condition for getting only one depth for a given specific energy?	2	K1	CO2
5. Distinguish between gradually varied flow and rapidly varied flow in open channel.	2	K2	CO3
6. Define afflux and back water curve.	2	K1	CO3
7. Differentiate the positive and negative surges.	2	K2	CO4
8. Write the practical applications of hydraulic jump.	2	K1	CO4
9. What is hydraulic turbine?	2	K1	CO5
10. Define the term specific speed of a turbine.	2	K1	CO5

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11. a) i) Find the discharge through a rectangular channel of width 2 m, having a bed slope of 4 in 8000. The depth of flow is 1.5 m. Use Chezy's formula, Take C=76.	7	K2	CO1
ii) Explain the different types of flow in open channel.	6	K2	CO1
OR			
b) Find the discharge through a circular pipe of diameter 3 m , if the depth of water in the pipe is 2.5 m and the pipe is laid at a slope of 1 in 1000. Take the value of Chezy's constant as 70.	13	K2	CO1
12. a) Derive the expression for most economical trapezoidal channel.	13	K2	CO2
(i) Half of top width = Length of one of the sloping sides			
(ii) Hydraulic mean depth = ½ depth of flow			
OR			
b) i) A 5m wide rectangular channel conveys 15 m ³ of water at a depth of 3 m. Find out Specific energy of flowing fluid, Critical depth, critical velocity and the minimum specific energy.	7	K3	CO2
ii) Draw the specific energy curve and explain its salient features	6	K2	CO2

13. a) Determine the slope of free surface water in a rectangular channel of width 20 m and depth 5m the channel has discharge of $15 \text{ m}^3/\text{s}$. Take $i_b=1/4000$ and $C=60$. 13 K2 CO3

OR

- b) Explain in detail the classification of flow profiles in gradually varied flow. 13 K2 CO3
14. a) i) The depth of flow of water at a certain section of rectangular channel 5m wide is 0.6m. The discharge through a channel is $15 \text{ m}^3/\text{s}$. If hydraulic jump take place on the downstream side, find the depth of flow after jump, height of the hydraulic jump and loss of energy per kg of water. 7 K3 CO4
- ii) Find an expression for loss of energy for a hydraulic jump. 6 K2 CO4

OR

- b) The depth and velocity of flow in a rectangular channel are 1 m and 1.5 m/s respectively. If the rate of inflow at the upstream end is suddenly doubled, what will be the height and absolute velocity of the resulting surge and celerity of the wave? 13 K3 CO4
15. a) i) Explain briefly about Pelton wheel turbines with neat sketches. 7 K2 CO5
- ii) Write briefly about the various efficiencies of hydraulic turbines. 6 K2 CO5

OR

- b) The hub diameter of a Kaplan turbine working under a head of 12 m is 0.35 times the diameter of the runner. The turbine is running at 100 r.p.m. If the vane angle of the extreme edge of the runner at outlet is 15° and flow ratio is 0.6. find:
- (i) Diameter of the runner
 - (ii) Diameter of the boss and
 - (iii) Discharge through the runner
 - (iv) The velocity of whirl at outlet is given as zero.

PART - C (1 × 15 = 15 Marks)

16. a) A centrifugal pump having 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 degrees at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm. Find the following, 15 K3 CO6
- (i). Vane angle at inlet
 - (ii). Work done by impeller on water per second
 - (iii). Manometric efficiency

OR

- b) i) A single acting reciprocating pump, running at 50 rpm delivers $0.01 \text{ m}^3/\text{s}$. The diameter of the piston is 200mm and stroke length 400mm. Determine the theoretical discharge of the pump. 8 K3 CO6
- ii) Describe the function of the air vessel for reciprocating pumps. 7 K2 CO6

