



B.Tech IV Semester Supplementary Examinations, July 2024

Hydraulics & Hydraulic Machinery
(CE)

Maximum Marks: 70

Date: 25.07.2024 Duration: 3 hours

- Note: 1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks		(10X2M=20 Marks)	CO	Bloom Tx
1	What is hydraulic jump?		1	L1
2	Explain the term slope of a bed, hydraulic mean depth and wetted perimeter		1	L1
3	What do you mean by dimensionless numbers? Name any four dimensionless numbers?		2	L1
4	Explain the terms: distorted and undistorted models.		2	L1
5	Define the impact of jets.		3	L1
6	What is jet propulsion?		3	L1
7	What is a draft tube? What are its functions?		4	L1
8	Explain about surge tank in turbines.		4	L1
9	What is negative slip in reciprocating pump?		5	L1
10	Write an expression for the head lost due to friction in suction and delivery pipes.		5	L1

Part-B

Answer All the following questions.		(5X10M=50Marks)		
11	An open channel of most economical section, having the form of a half hexagon with horizontal bottom is required to give a maximum discharge of 20.2m ³ /sec of water. The slope of the channel bottom is 1 in 2500. Take chezy's constant, C=60 in chezy's equation, determine the dimensions of the cross-section, assume n=2/3. (10M)		1	L2
OR				
12	Derive expression for kinetic energy correction factor. (10M)		1	L2
13	a) Explain about similarities? (5M) b) Explain about different types of forces acting in moving liquid. (5M)		2	L2
OR				
14	The pressure difference Δp in a pipe of diameter D and length due to turbulent flow depends on the velocity V, viscosity μ , density ρ and roughness K. Using Buckingham's π -theorem, obtain expression for Δp . (10M)		2	L2

15	Prove that the force exerted by the jet of water on a fixed semi-circular plate in the direction of the jet when the jet strikes the centre of the semi-circular plate is two times the force exerted by the jet on a fixed vertical plane. (10M)	3	L2
OR			
16	Show that for a curved radial vane, the work done per second is given by $\rho a V_1 [V_{w1} u_1 \pm V_{w2} u_2]$ (10M)	3	L2
17	a) Define turbine and explain its classifications. (5M) b) A turbine develops 9000KW when running at a speed of 140rpm and under a head of 30m. Determine the specific speed of the turbine. (5M)	4	L2
OR			
18	a) Define the term unit power, unit speed and unit discharge with reference to a hydraulic turbine. And also derive the expression for these terms. (5M) b) Design a pelton wheel which is required to develop 1500 kW, when working under a head of 160 m at a speed of 420 rpm. The overall efficiency may be taken as 85% and assume other data required. (5M)	4	L2
19	A centrifugal pump rotating at 1000rpm delivers 160 lit/sec of water against a head of 30m. The pump is installed at a place where atmospheric pressure is 1×10^5 KPa. and vapour pressure of water is 3 KPa. The head loss in suction pipe is equivalent to 0.2m of water. Calculate: i) Maximum NPSH and ii) Maximum allowable height of the pump from free surface of water in the sump. (10M)	5	L2
OR			
20	A centrifugal pump with 1.2m diameter runs at 200 r.p.m. and pumps 1880 liters/s, the average lift being 6m. The angle which the vanes make at exit with the tangent to the impeller is 26° and the radial velocity of flow is 2.5m/s. Determine the manometric efficiency and the least speed at start pumping against a head of 6m, the inner diameter of the impeller being 0.6m. (10M)	5	L2