



B.Tech IV Semester Supplementary Examinations, February 2024
Hydraulics and Hydraulic Machinery
 (Civil Engineering)

Maximum Marks: 70

Date: 23.02.2024 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	Explain the terms: (i) Rapidly varied flow and (ii) Gradually varied flow	CO1	L1
2	Outline the terms: (i) Wetted perimeter (ii) Hydraulic mean depth	CO1	L1
3	Explain the terms: (i) Distorted models (ii) Undistorted models	CO2	L1
4	Define and explain the terms of Froude number and Mach number	CO2	L2
5	What is impact of jets?	CO3	L1
6	Outline the momentum equation.	CO3	L2
7	What is meant by specific speed and what is its significance in turbine selection?	CO4	L2
8	Differentiate between turbines and pumps.	CO4	L1
9	Differentiate between the volume casing and vortex casing for the centrifugal pump	CO5	L2
10	What is priming of a centrifugal pump?	CO5	L2

Part-B

Answer All the following questions. (5X10M=50Marks)			
11	A. Derive an expression for the discharge through a channel by Chezy's formula. 5M B. The rate of flow of water through a circular channel of diameter 0.6 m is 150 liters/s. Find the slope of the bed of the channel for maximum velocity. 5M Take C = 60	CO1	L3 L3
OR			
12	Find an expression for loss of energy head for a hydraulic jump. 10M	CO1	L4
13	The pressure drop ' Δp ' in a pipe of diameter D and length l depends on mass density ρ and viscosity μ of the flowing fluid, mean velocity of flow V and average height k of roughness projections on the pipe surface. Obtain a dimensionless expression for Δp . Hence show that $h_f = f l V^2 / 2gD$ where h_f is the head loss due to friction = $(\Delta p / w)$, w is the specific weight of the fluid and f is	CO2	L4

	coefficient of friction. 10M		
	OR		
14	State Buckingham's π theorem. What do you mean by repeating variables? How repeating variables selected in dimensional analysis? 10M	CO2	L4
15	Obtain the expression for the force exerted by a jet of water on a fixed curved plate in the direction of the jet. 10M	CO3	L3
	OR		
16	A 50 mm diameter jet having a velocity 25 m/s, strikes a flat plate, the normal of which is inclined at 30° to the axis of the jet. Calculate the normal force exerted on the plate (a) when the plate is stationary, (b) when the plate is moving with a velocity of 10 m/s in the direction of the jet, (c) when the plate is moving with a velocity of 8 m/s parallel to itself and in the direction of the normal to its surface. Find also the work done and the efficiency of the jet when the plate is moving. 10M	CO3	L4
17	Define the specific speed of a turbine. Derive an expression for the specific speed. What is the significance of the specific speed? 10M	CO4	L3
	OR		
18	A turbine is to operate under a head of 25 m at 200 rpm The discharge is 9 cumec. If the efficiency is 90%, determine: 10M i. Specific speed of the turbine ii. Power generated iii. Type of turbine	CO4	L4
19	Describe multistage pump with impellers in parallel and series. 10M	CO5	L3
	OR		
20	A centrifugal pump is to discharge $0.118 \text{ m}^3/\text{s}$ at a speed of 1450 rpm., against a head of 25 m. the impeller diameter is 25 cm its width at outlet is 5 cm and manometric efficiency is 75 %. Determine the vane angle at the outer periphery of the impeller. 10M	CO5	L4