PVP 23

Code: 23CE3403

II B.Tech - II Semester – Regular Examinations - MAY 2025

HYDRAULICS & HYDRAULIC MACHINERY
(CIVIL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

BL – Blooms Level CO – Course Outcome

PART – A

		BL	CO
1.a)	What is the effect of change in Reynold's number on the friction factor in turbulent flow?	L2	CO1
1.b)	What is role of boundary layer theory to enhance the velocity of golf ball?	L2	CO1
1.c)	What is the significance of Moody's chart?	L2	CO2
1.d)	Write the limits of Reynolds number for open channel flow and pipe flow.	L1	CO2
1.e)	What conditions are to be satisfied for a channel section is said to be efficient channel section?	L2	CO3
1.f)	If water is flowing through a pipe of 5 cm diameter under a pressure of 20 N/cm^2 and a mean velocity of 2 m/s, find the kinetic head?	L2	CO3
1.g)	Provide the details of turbines efficiency based on the depth of flow.	L2	CO4
1.h)	Distinguish between steady and unsteady flow.	L2	CO4
1.i)	For a fully-developed pipe flow, how does the pressure vary with the length of the pipe?	L2	CO5
1.j)	What is priming of a pump?	L1	CO5

PART – B

			BL	CO	Max. Marks
UNIT-I					
2		Find an expression for the loss of head of a viscous fluid flowing between two fixed parallel plates.	L3	CO1	10 M
OR					
3		Explain the boundary layer theory with various applications, using the concept of displacement, momentum and energy thickness for a flat plate.	L3	CO1	10 M
UNIT-II					
4		Derive the following conditions for most economical trapezoidal channel section. i) Side length = half of the top width ii) hydraulic mean depth (m) = d/2	L4	CO2	10 M
OR					
5		A canal of trapezoidal section has a bed width of 7 m and bed slope of 1 in 3500. If the depth of flow is 2.7 m and side slopes of the channel are 1 horizontal to 3 vertical, determine the average flow velocity and the discharge carried by the channel. Also compute the average shear stress at the channel boundary. Take value of Chezy's constant= 50.	L4	CO2	10 M
UNIT-III					
6	a)	The discharge of water through a rectangular channel of width 8m, is 18 m^3/s when the depth of water is 1.2 m. Calculate: (i) specific energy of the flowing water, (ii) Critical depth and	L4	CO3	5 M

		Critical velocity, and (iii) value of minimum specific energy.			
	b)	The depth of flow of water, at a certain section of a rectangular channel of 4m wide is 0.5 m. The discharge through the channel is 18 m^3/sec. If a hydraulic jump takes place on the downstream side, find the depth of flow after the jump.	L4	CO3	5 M
OR					
7	Find the slope of the free water surface in a rectangular channel of width (i) 20m and (ii) 30m, having depth of flow 5m. The discharge through the channel is 60 m^3/s. The bed of the channel is having a slope of 1 in 4000. Take the value of Chezy's constant C = 60.		L4	CO3	10 M
UNIT-IV					
8	a)	Derive an expression for force exerted by a jet on inclined plate moving in the direction of jet.	L3	CO4	5 M
	b)	Draw the velocity triangles, work done and maximum hydraulic efficiency of a Pelton wheel turbine.	L3	CO4	5 M
OR					
9	The penstock supplies water from a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is 2.0 m^3/s. The angle of deflection of the jet is 165^o. Determine the power given by the water to the runner and also hydraulic efficiency of the Pelton wheel. Take speed ratio = 0.45 and Cv = 1.0.		L4	CO4	10 M

UNIT-V					
10	a)	Briefly explain the main parts of centrifugal pump with neat sketches.	L3	CO5	5 M
	b)	The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 r.p.m. The vane angles of the impeller at inlet and outlet are 20^o and 30^o respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water.	L3	CO5	5 M
OR					
11	a)	Explain the Cavitation in centrifugal pump, its effects and precautions.	L4	CO5	5 M
	b)	How will you obtain an expression for the minimum speed for starting a centrifugal pump?	L3	CO5	5 M