Question Paper Code: R15A22CE02

R15

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech. II Semester Supplementary Examinations, June/July – 2024

HYDRAULICS AND HYDRAULIC MACHINES

(CIVIL ENGINEERING)

Time: 3 Hours **Max. Marks: 75**

Section – A (Short Answer type questions) (25 Marks)

Answer All Questions

		Course Outcome	B.T Level	Marks
1.	List the types of open channel flow	CO1	L1	2M
2.	Draw typical velocity distribution across a rectangular channel.	CO1	L2	3M
3.	List the guidelines for choosing the repeating variables in Buckingham's pi method.	CO2	L1	2M
4.	When will a hydraulic jump occur?	CO2	L2	3M
5.	Classify turbines.	CO3	L1	2M
6.	Draw the layout of a typical hydro-power plant	CO3	L2	3M
7.	Write the expression for specific speed.	CO4	L1	2M
8.	What are the performance characteristics of a turbine?	CO4	L2	3M
9.	Classify pumps.	CO5	L1	2M
10.	Expand the abbreviation 'NPSH'. What does it signify?	CO5	L2	3M

Section B (Essay Questions)

Answer all questions, each question carries equal marks. **(5 X 10M = 50M)**

11. A)	A rectangular channel carries water at the rate of 400 litres per second when bed slope is 1 in 2000. Find the most economical dimensions of the channel if Chezy's constant C = 50.	CO1	L3	10M
	OR			
B)	The discharge of water through a rectangular channel of width 8 m, is 15 m^3/s when the depth of flow of water is 1.2 m. Calculate specific energy of flowing water, critical depth, critical velocity and value of minimum specific energy.	CO1	L3	10M
12. A)	Find the rate of change of depth of water in a rectangular channel of 10 m wide and 1.5 m deep, when the water is flowing with a velocity of 1 m/s. The flow of water through the channel of bed slope 1 in 4000, is regulated in such a way that energy line is having a slope of 0.00004.	CO2	L3	10M
	OR			
B)	A partially sub-merged body is towed in water. The resistance R to its motion depends on the density ρ, the viscosity μ of water, length L of the body, velocity V of the body and the acceleration due to gravity g. Show that the resistance to the motion can be expressed in the form: $$R = \rho L^2 V^2 \emptyset \left[\left(\frac{\mu}{\rho V L}\right).\left(\frac{Lg}{V^2}\right)\right]$$	CO2	L3	10M

13. A)	Derive the force exerted by a jet striking a stationary symmetric curved plate at one end tangentially.	CO3	L2	10M
	OR			
B)	Explain in detail about the various parts and working mechanism of a Kaplan turbine with neat sketch.	CO3	L2	10M
14. A)	A Pelton wheel is to be designed for the following specifications: Shaft power = 11,772 kW; Head = 380 metres; speed = 750 r.p.m; Overall efficiency = 86%; Jet diameter is not to exceed one-sixth of the wheel diameter. Determine the wheel diameter, number of jets required and diameter of the jet.	CO4	L3	10M
	OR			
B)	A turbine develops 9000 kW when running at 10 r.p.m. The head on the turbine is 30 m. If the head on the turbine is reduced to 18 m, determine the speed and power developed by the turbine.	CO4	L3	10M
15. A)	The diameters of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. Determine the minimum starting speed of the pump if it works against a head of 30 m.	CO5	L3	10M
	OR			
B)	A power station has a maximum demand of 20,000kW, an annual load factor is 50%, and plant capacity factor, is 40% determine the reserve capacity of the plant.	CO5	L3	10M