Question Paper Code: R22A22CE03

R18

ANURAG Engineering College

(An Autonomous Institution)

II B.Tech II Semester Supplementary Examinations, Jan/Feb-2024

HYDRAULICS & 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.	Differentiate between fundamental dimensions and secondary quantities	CO1	L2	2M
2.	Explain the term dimensionally homogeneous equation and give one example	CO1	L2	3M
3.	State momentum equation and mention some of its engineering applications	CO2	L2	2M
4.	Explain the terms i) Axial flow ii) Mixed flow	CO2	L2	3M
5.	Write the functions of casing of the centrifugal pump	CO3	L2	2M
6.	What is cavitation? What are the effects of cavitation?	CO3	L1	3M
7.	explain the terms: i) Natural channel ii) Artificial channel	CO4	L2	2M
8.	Draw the specific energy curve and mention each component.	CO4	L1	3M
9.	Write the assumptions of the dynamic equation of the channel	CO5	L2	2M
10.	Briefly explain the fallowing terms with neat sketches. i) Mild slope ii) Steep slope	CO5	L2	3M

Section B (Essay Questions)

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

11. A)	State Buckingham's π-theorem. Why this theorem is considered superior over the Rayleigh's method for dimensional analysis. How are the repeating variables selected for dimensional analysis?	CO1	L2	10M
	OR			
B)	i) Explain the different types of hydraulic similarities that must exist between a prototype and its model?	CO1	L2	6M
	ii) In a 1 in 40 model of spillway velocity and discharge are 2 m/s and 2.5 m^3/s. Find the corresponding velocity and discharge in prototype.		L3	4M
12. A)	i) Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet.	CO2	L3	5M
	ii) A 225 cm diameter jet of water with a velocity of 15 m/s strikes a plate normally, if the plate is moving with a velocity of 5 m/s in the direction of jet, find (i) the force on the plate and (ii) the efficiency of the jet.			5M
	OR			
B)	i) What is the basis of selection of a turbine at a particular place?	CO2	L3	4M
	ii) Design a Pelton wheel for a head of 80m and speed of 300 RPM. The Pelton wheel develops 110 kW. Take co-efficient of velocity is 0.98, speed ratio is 0.48 and overall efficiency is 80%.			6M

13. A)	A two-stage centrifugal pump has impeller 40 cm in diameter and in diameter and 2.5 cm wide at outlet. The vanes are curved back at the outlet at 300 and reduce the circumferential area by 15%. The manometeric efficiency is 85% and overall efficiency is 75%. Determine the head generated by the pump when running at 12000 rpm. And discharge is 0.06m3/s. Find the shaft power also.	CO3	L3	10M
	OR			
B)	i) What are the bases of classification of hydro power plants ii) With a neat sketch explain the layout of a hydro-power plant	CO3	L2	5M 5M
14. A)	Prove that for the trapezoidal channel of most economical section. i) Half of top width = length of one of the sloping slides ii). Hydraulic mean depth is $\frac{1}{2}$ depth of flow	CO4	L3	10M
	OR			
B)	Water flowing through a rectangular channel of 4 m in which at a rate of $12m^3/s$. The depth of water in the channel is 1.6 m. Calculate the specific energy, the critical depth, critical velocity and the minimum specific energy head.	CO4	L3	10M
15. A)	Discuss the critical slope and mild slope, steep slope and adverse slope with neat sketch slopes and give Illustrate your answer with sketches.	CO5	L3	10M
	OR			
B)	Rectangular channel carrying a super critical flow to be provided wit ha hydraulic jump of energy dissipated, energy loss required in hydraulic jump is 6m. Inlet Froude number is 10. Determine subsequent depth.	CO5	L3	10M