

Register No : _____

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Fourth Semester

Civil Engineering

CE3401 - Applied Hydraulics Engineering

Regulations - 2021

Duration : 3 Hrs

Maximum : 100 Marks

PART - A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
1.	State the difference between super-critical and sub-critical flow.	RE	1	2
2.	Infer the conditions for a trapezoidal section to be a most economical one.	UN	1	2
3.	List the different types of flow profiles in open channels.	RE	2	2
4.	Interpret the effect of changes in channel grade over the flow profile.	UN	2	2
5.	Define hydraulic jump and its significance in open channel flow.	RE	3	2
6.	Outline the role of the momentum equation in analyzing rapidly varied flow.	UN	3	2
7.	Differentiate impulse turbine and reaction turbine.	RE	4	2
8.	Justify the importance of draft tube in a turbine.	RE	4	2
9.	Explain the concept of negative slip in reciprocating pumps.	UN	5	2
10.	Define NPSH (Net Positive Suction Head).	RE	5	2

PART - B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a i Find the discharge through a trapezoidal channel of width 8 m and side slope of 1 horizontal to 3 vertical. The depth of flow of water is 2.4 m and value of Chezy's constant, C = 50. The slope of the bed of the channel is given 1 in 4000.	AN	1	8
	ii A rectangular channel carries water at the rate of 400 liters/sec when bed slope is 1 in 2000. Find the most economical dimensions of the channel if C = 50.	AN	1	5
	Or			
	b A trapezoidal channel with side slopes of 1 to 1 has to be designed to convey 10 m ³ /sec at velocity of 2 m/sec so that the amount of concrete lining for bed and sides is minimum. Calculate the area of linear required for 1 m length of canal.	AN	1	13

12.	a	Find the slope of the free water surface in a rectangular channel of width 20 m, having depth of flow 5 m. The discharge through the channel is 50 m ³ /sec. The bed of the channel is having a slope of 1 and 4000. Take the value of Chezy's constant C = 60.	AN	2	13
		Or			
	b	Determine the length of the back water curve caused by an afflux of 2.0 m in a rectangular channel of width 40 m and 2.5 m. The slope of the bed is given as 1 in 11000. Take Manning's N = 0.03.	AN	2	13
13.	a	The depth of flow of water, at a certain section of rectangular channel of 2 m wide, is 0.3 m. The discharge through the channel is 1.5 m ³ /sec. Determine whether a hydraulic jump will occur and if so find its height and loss of energy per kg of water.	AN	3	13
		Or			
	b	A hydraulic jump forms of the downstream end of spillway carrying 17.93 m ³ /sec discharge. If the depth before jump is 0.80 m, determine the depth after the jump and energy loss.	AN	3	13
14.	a	A Pelton wheel is to be designed for a head of 60 m when running at 200 rpm. The pelton wheel develops 95.6475 kW shaft power. The velocity of buckets = 0.45 times the velocity of jet, overall efficiency = 0.85 and co-efficient of the velocity is equal to 0.98.	AP	4	13
		Or			
	b	The following data is given for a Francis turbine. Net head = 60 m. Speed, N = 700 rpm. Shaft power = 294.3 kW. $\eta_0 = 84\%$, $\eta_h = 93\%$, flow ratio = 0.20. Breadth ratio, $b = 0.1$, Outer diameter of the runner = 2 x inner diameter of the runner. The thickness of vanes occupies 5% of circumferential area of the runner, velocity of flow is constant at inlet and outlet and discharge is radial at outlet. Determine, i) Guide blade angle, ii) Runner vane angle at inlet and outlet iii) Diameters of runners at inlet and outlet	AP	4	13
15.	a	A centrifugal pump is to discharge 0.118 m ³ /s at a speed of 1450 rpm against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and Manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller.	AP	5	13
		Or			
	b	A single acting reciprocating pump, running at 50 rpm delivers 0.01 m ³ /s of water. The diameter of the piston is 200 mm and stroke length 400 mm. Determine, i) Theoretical discharge of the pump ii) Co-efficient of discharge iii) Slip and percentage slip of the pump	AP	5	13

*PART – C (Marks 1*15 = 15)*

<i>Q.No</i>		<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
16.	a	The discharge of water through a rectangular channel of the width 8 m, is 15 m ³ /sec when depth of flow of water is 1.2 m. Calculate, i) Specific energy of flowing water ii) Critical depth and critical velocity iii) Value of minimum CC energy	AN	1	15
Or					
	b	A Pelton wheel is having a mean bucket diameter of 1 m and is running 1000 rpm. The net head on the Pelton is 700 m. If the side clearance angle is 15° and discharge through the nozzle is 0.1 m ³ /sec, find i) Power available at the nozzle, ii) Hydraulic efficiency of the turbine.	AN	4	15