Q. Code:585723

Reg. No. | | | | | | | | | | | | | |

B.E. / B.TECH. DEGREE EXAMINATIONS, MAY 2024

Fourth Semester

CE22409 – APPLIED HYDRAULIC ENGINEERING: THEORY AND PRACTICES

(Civil Engineering)

(Regulation 2022)

TIME: 2 HOURS **MAX. MARKS: 60**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
	After the successful completion of the course students will be able to	3
CO 1	Compute the discharge in a steady uniform flow in a channel using the concepts of energy equation	3
CO 2	Analyse the various water surface profiles in the steady gradually varied flow.	3
CO 3	Calculate the depth of flow before and after hydraulic jump using the concepts of momentum equation in the rapidly varied flows.	3
CO 4	Analyse the performance of the various types of turbines.	3
CO 5	Analyse the performance of rotodynamic pumps and reciprocating pumps	3

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Determine the specific energy for the flow in open channel expressed by V=2.22 m/s and y=1 m.	1	2
2.	A wide rectangular channel carries a flow of 2.5 m^3/s per metre width. The bed slope of the channel is 2.43 x 10^{-1} and Manning's N=0.020. If at a section the depth of flow is 2.5 m, find the energy slope at the section.	2	2
3.	In a hydraulic jump occurring in a horizontal rectangular channel, the sequent depth ratio is 7.0. Classify the hydraulic jump.	3	3
4.	How is Pelton wheel different from Francis turbine?	4	2
5.	How does the cavitation will occur in centrifugal pumps?	5	2
6.	A pump delivers 2.25x10^3 litres/s under a head of 18 m while running at a speed of 3600 rpm. Compute the specific speed of the pump.	5	2
7.	A centrifugal pump delivers water against a net head of 14.5 m and a design speed of 1000 rpm. The impeller diameter is 300 mm and outlet width is 50mm. Determine the discharge of the pump if velocity of flow at outlet is 3.556 m/s.	5	2
8.	A double acting reciprocating pump running at 40 rpm is discharging 0.01666 m^3/s of water. The pump has stroke of 0.4 m. The diameter of the piston is 0.2m. Find the theoretical discharge of the pump.	5	2
9.	Explain the purpose of air vessels fitted to the suction pipe and delivery pipe close to	5	2

the cylinder of a single acting reciprocating pump.

		Marks	CO	RBT LEVEL
10.	What is negative slip and explain reasons for it in reciprocating pump?	**5**	**2**	

PART- B (3 x 10 = 30 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Prove that for the trapezoidal channel of most economical section: (i) Half of top width = Length of one of the sloping sides (ii) Hydraulic mean depth = ½ depth of flow	**(10)**	**1**	**3**
	(OR)			
(b)	The discharge of water through a rectangular channel of width 6 m is 18 m^3/s when depth of flow of water is 2 m. Calculate: (i) Specific energy of the flowing water (ii) Critical depth and critical velocity (iii) Value of minimum specific energy	**(10)**	**1**	**3**
12. (a)	Find the slope of the free water surface in a rectangular channel of width 15 m, having depth of flow 4 m. The discharge through the channel is 40 m^3/s. The bed of the channel is having a slope of 1 in 4000. Take the value of Chezy's constant, C=50.	**(10)**	**2**	**3**
	(OR)			
(b)	Determine the length of the back water curve caused by an afflux of 2 m in a rectangular channel of width 40 m and depth 2.5 m. The slope of the bed is given as 1 in 11000. Take Manning's N=0.03.	**(10)**	**2**	**3**
13. (a)	A sluice gate discharges water into a horizontal rectangular channel with a velocity of 6 m/s and depth of flow is 0.4 m. The width of the channel is 8 m. Determine whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water. Also determine the power lost in the hydraulic jump.	**(10)**	**3**	**3**
	(OR)			
(b)	A 3 m wide rectangular channel has a flow of 3.6 m^3/s with a velocity of 0.8 m/s. If a sudden release of additional flow at the upstream end of the channel causes the depth to rise by 50%, determine the absolute velocity of the resulting surge and the new flow rate?	**(10)**	**3**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.14 is compulsory)

		Marks	CO	RBT LEVEL
14.	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 the bucket =0.45 times the velocity of the jet, overall efficiency= 0.85 and coefficient of the velocity is equal to 0.98.	**(10)**	**4**	**3**

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