Q. Code: 255069

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

B. E / B. TECH.DEGREE EXAMINATION, MAY 2023

Fourth Semester

CE18402 – APPLIED HYDRAULIC ENGINEERING

(Civil Engineering)

(Regulation 2018A)

TIME:3 HOURS **MAX. MARKS: 100**

CO1 Compute the discharge in a steady uniform flow in a channel using the concepts of energy equation.

CO2 Analyse the various water surface profiles in the steady gradually varied flow.

CO3 Calculate the depth of flow before and after hydraulic jump using the concepts of momentum equation in the rapidly varied flows.

CO4 Analyse the performance of the various types of turbines.

CO5 Analyse the performance of rotodynamic pumps and reciprocating pumps

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	What is Open channel flow?	**1**	**1**
2.	If the critical depth of the Rectangular shaped open channel is 2 m, calculate the specific energy.	**1**	**3**
3.	Distinguish between drawdown and backwater curves.	**2**	**2**
4.	List out the methods to determine the length of surface profile in gradually varied flow.	**2**	**1**
5.	Enlist the classification of hydraulic jumps.	**3**	**1**
6.	Determine the conjugate depth if initial Froude number is 6.75 and energy loss is 15 Nm/N.	**3**	**3**
7.	How would you classify turbines based on the direction of flow in the runner?	**4**	**2**
8.	What are the uses of draft tubes?	**4**	**2**
9.	What is Priming? How it can be avoided?	**5**	**2**
10.	What are the causes of cavitation?	**5**	**2**

PART- B (5x 14=70Marks)

		Marks	CO	RBT LEVEL
11. (a)	Design a lined canal to carry a discharge of 15 cumec. The side slope is 1H:1V on one side and on other side its truly vertical face. Take n=0.012 and bed slope is 1in 5000. Design the canal for most economical section.	**(14)**	**1**	**3**
	(OR)			
(b)	A Rectangular channel carries a water flow of 18 m^3/sec and has n=0.014 and bed width as 5.5 m. find the following. i) Critical Depth ii) Minimum Specific Energy iii) Depth of flow for specific energy of 4.5 m. iv) What is the type of flow if the depths of flow are 2 m and 1.5 m?	**(14)**	**1**	**3**

12. (a)	A rectangular channel 10 m wide carries a discharge of 30 m^3/sec. It is laid at a slope of 0.0001. Compute the back water profile created by a dam which backs up the water to a depth of 3.5 m immediately behind the dam .Use direct method for computation.	**(14)**	**2**	**3**
	(OR)			
(b)	Explain the features of water surface flow profile classifications.	**(14)**	**2**	**2**
13. (a)	Hydraulic jump occurs on a horizontal rectangular channel. Prove that post jump depth will be given by: $\frac{y_2}{y_1} = \frac{1}{2}\left[-1+\sqrt{1+8F_{r_1}^2}\right]$ Where y_1 and y_2 are pre jump and post jump depths respectively. F_{r1} is the Froude number for the supercritical flow.	**(14)**	**3**	**3**
	(OR)			
(b)	In a hydraulic jump occurring in a rectangular channel of 3m width, the discharge is 7.8 m^3/sec and depth before the jump is 0.28 m. Estimate (i) Sequent depth (ii) the length of the jump (iii) Type of jump and (iv) the energy loss in the jump.	**(14)**	**3**	**3**
14. (a)	A Pelton turbine is required to develop 9000 kW when working under a head of 300 m. The runner may rotate at 500 rpm. Assuming the jet ratio as 10, speed ratio as 0.46 and overall efficiency as 85%, determine the following : (1) Quantity of water required (2) Diameter of the wheel (3) Number of jets.	**(14)**	**4**	**3**
	(OR)			
(b)	Draw the characteristic curves of turbines and explain.	**(14)**	**4**	**2**
15. (a)	With the help of neat sketches, explain the features of a volute type and a diffusion type centrifugal pump.	**(14)**	**5**	**2**
	(OR)			
(b)	A single-acting reciprocating pump, running at 60 rpm is discharging 0.02 cumecs of water. The pump has a stroke length of 350 mm and plunge diameter of 250 mm. Determine i) The theoretical discharge of the pump ii) Coefficient of discharge iii) Slip and percentage slip of the pump	**(14)**	**5**	**3**

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

		Marks	**CO**	**RBT LEVEL**
16.	Derive the dynamic equation for gradually varied flow stating the assumptions made.	**(10)**	**2**	**3**

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