O.P.Code: 23CE0114	R23	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech. II Year II Semester Supplementary Examinations December-2025
HYDRAULICS & HYDRAULIC MACHINERY
(Civil Engineering)

Time: 3 Hours **Max. Marks: 70**

PART-A
(Answer all the Questions **10 x 2 = 20** Marks)

1	a	What is the aim of Reynolds experiment.	CO1	L1	2M
	b	State Stoke's law.	CO1	L1	2M
	c	Differentiate uniform flow and non uniform flow.	CO2	L1	2M
	d	What is open channel flow?Give example.	CO2	L1	2M
	e	Calculate critical depth of a rectangular channel having discharge per unit width is 3cumec/s/m.	CO3	L2	2M
	f	Enumerate hydraulic jump,height of the jump.	CO3	L2	2M
	g	Define turbine.	CO4	L1	2M
	h	Calculate the force exerted by the jet on a stationary flat plate held normal to the jet having area of 2 sq.m with a velocity of 3 m/s.	CO5	L1	2M
	i	Define specific speed of a pump.	CO6	L1	2M
	j	Define multistage centrifugal pump.	CO6	L2	2M

PART-B
(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2		Derive Navier – Stokes equations of motion.	CO1	L4	10M

OR

3	a	List out the characteristics of laminar flow and give examples for laminar flow.	CO1	L1	5M
	b	Oil of absolute viscosity 1.5 poise and density 848.3 kg/m3 flow through a 30 cm diameter pipe. If the head loss in 3000 m length of a pipe is 20 m. Assuming laminar flow, determine the velocity, Reynolds number and friction factor	CO1	L2	5M

UNIT-II

4	a	Derive the conditions to be most economical trapezoidal channel section	CO2	L2	5M
	b	Design an earthen trapezoidal channel for water having a velocity of 0.6 m/s, side slope of the channel is 1:1.5 and quantity of water flowing is 3 cumec. Assume C as 65.	CO2	L3	5M

OR

5	a	Define and state the formulae of Energy and momentum Correction factors.	CO2	L2	5M
	b	Define the following terms: Hydraulic radius, Wetted perimeter and Slope of the bed.	CO2	L1	5M

UNIT-III

6	a	In a rectangular channel of width 24 m and depth of flow 6 m, the rate of flow of water is 86.4 m3 /s. If the bed slope of the channel is 1 in 4000, find the slope of the free water surface. Take C = 60.	CO3	L3	5M
	b	Explain back water curve and afflux with a neat sketch.	CO3	L2	5M

OR

7	a	Define specific force, specific depth and critical depth.	CO4	L1	5M
	b	In a rectangular channel of 0.5 m width, a hydraulic jump occurs at a point where depth of water flow is 0.15 m and Froude number is 2.5. Determine specific energy, critical and subsequent depths, loss of head and Energy dissipated.	CO4	L4	5M

UNIT-IV

8	a	List out various design aspects of Pelton Wheel	CO5	L2	5M
	b	A Pelton wheel is to be designed for the following specifications: Power = 9560 kW, Head = 350 m, Speed = 750 rpm, Overall efficiency = 85%, Jet diameter not to exceed 1/6 th of the wheel diameter. Determine wheel diameter, diameter of the jet and number of jets required. Take coefficient of velocity as 0.985 and speed ratio as 0.45.	CO5	L2	5M

OR

9	a	Explain characteristics curves of a turbine with a neat sketch.	CO5	L3	5M
	b	Define cavitation and explain its causes and its effect.	CO5	L1	5M

UNIT-V

10	a	Explain work done by the centrifugal pump with a neat sketch	CO6	L2	5M
	b	The impeller of a centrifugal pump having external and internal diameters 500 mm and 250 mm respectively, width at outlet 50 mm and running at 1200 rpm works against a head of 48 m. The velocity of flow through the impeller is constant and equal to 3.0 m/s. The vanes are set back at an angle of 40 degrees at outlet. Determine inlet vane angle, work done by the impeller on water per second and manometric efficiency.	CO6	L4	5M

OR

11	a	Derive an expression for minimum starting speed of a centrifugal pump	CO6	L2	5M
	b	A centrifugal pump impeller has diameters at inlet and outlet as 360 mm and 720 mm respectively. The flow velocity at outlet is 2.4 m/s and the vanes are set back at an angle of 45 degrees at the outlet. If the manometric efficiency is 70 percent, calculate the minimum starting speed of the pump.	CO6	L4	5M

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