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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech II Year II Semester Regular Examinations July-2021

FLUID MECHANICS & HYDRAULIC MACHINERY

(Agricultural Engineering)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12 = 60** Marks)

UNIT-I

1	**a**	A plate 0.025mm at a distance from a fixed plate moves at 60 cm/sec and requiresa force of 2 N/m2. Determine viscosity between the plates.	L3	**6M**
	b	Discuss the U- tube Manometer in detail and derive the expression for pressure.	L2	**6M**
		OR		
2	**a**	State Pascal's law. What do you understand the terms Absolute, Gauge & vacuumpressure?	L1	**6M**
	b	A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity is 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40cm and the height of fluid in the left from the center of pipe is 15cm below.	L4	**6M**
		UNIT-II		
3	**a**	Derive Euler's equation of motion.	L2	**6M**
	b	Define the following terms: Velocity potential function, stream function and flow net.	L1	**6M**
		OR		
4	**a**	Define the terms: Stream line, streak line, path line, stream tube.	L1	**6M**
	b	Explain Momentum correction factor, Energy correction factor.	L4	**6M**
		UNIT-III		
5	**a**	A horizontal pipeline 40 m long is connected to a water tank at one end and discharges freely into the atmosphere at other end. For the first 25 m of its length from the tank, the pipe is 150 mm diameter and its diameter is suddenly enlarged to 300 mm. the height of water level in the tank is 8 m above the centre of pipe. Considering all losses of head which occur, determine the rate of flow. Take f =0.01 for both sections of the pipe.	L3	**10M**
	b	List out minor losses in pipe flow.	L1	**2M**
		OR		
6	**a**	Explain about orifice meter with neat sketches. Derive expression for rate of flow through orifice meter.	L2	**10M**
	b	Explain pitot static tube.	L2	**2M**

UNIT-IV

7	a	Derive an expression for the hydraulic efficiency when a liquid jet strikes a single fixed curved vane.	L2	5M
	b	A jet of water of diameter 50mm moving with a velocity of 25 m/s impinges on a fixed curved plate tangentially at one end at an angle of 30° to the horizontal. Calculate the resultant force of the jet on the plate if the jet is reflected through an angle of 50°. Take g = 10 m/s^2	L3	7M

OR

8	a	Explain the different types of hydroelectric power stations.	L2	4M
	b	Derive an expression for the hydraulic efficiency when a liquid jet strikes an unsymmetrical moving curved plate when jet strikes tangentially at one of the tip.	L2	8M

UNIT-V

9		The following data is given for the Francis turbine. Net head H = 60 m, Speed N = 700 r.p.m., Shaft Power = 294.3 kW, η_o = 84 % η_h = 93 %, flow ratio = 0.2, breadth ratio n = 0.1, outer diameter of the runner = 2 X inner diameter of the runner. The thickness of vane occupies 5% of circumferential area of the runner, velocity of flow is constant at inlet and outlet and discharge is radially at outlet. Determine: (i) Guide blade angle,(ii) Runner vane angles at inlet and outlet, (iii) Diameters of runner at inletand outlet, and (iv) Width of wheel at inlet.	L1	12M

OR

10		The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 rpm. The vane angles of the impeller at inlet and outlet are 20° and 30° respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water.	L1	12M

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