O.P.Code: 19CE0151	R19	H.T.No.									

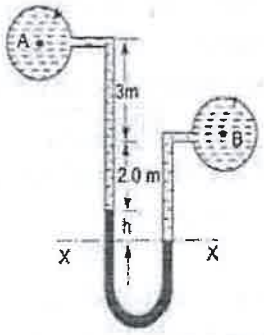
SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech III Year I Semester Supplementary Examinations June-2024
FLUID MECHANICS & HYDRAULIC MACHINERY
(Mechanical Engineering)

Time: 3 Hours **Max. Marks: 60**

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

UNIT-I

1	a	Calculate the capillary raise in a glass tube of 2.5mm diameter when immersed vertically water & mercury. Take surface tension is 0.0725 N/m for water and 0.52 N/m for mercury. The specific gravity of mercury is given 13.6 and angle of contact is 1300 .	CO1	L3	6M
	b	Define and mention units for the following fluid properties: Density, specific weight, specific volume and specific gravity of a fluid.	CO1	L1	6M
		OR			
2	a	List out different types of manometers. Explain about piezometer in detail.	CO1	L1	6M
	b	A differential manometer is connected at two points A and B of two pipes as shown in the figure. The pipe A contains a liquid of specific gravity 1.5 while pipe B contains a liquid of specific gravity 0.9 pressure at A and B are 1 kgf/cm2 and 1.80 kgf/cm2 respectively. Find the difference in Mercury level in a differential manometer.	CO1	L4	6M



UNIT-II

3	a	Define the following terms: Velocity potential function, stream function and flow net.	CO2	L1	6M
	b	Water flows through a pipe AB 1.2 m diameter at 3 m/s and then passes through a pipe BC 1.5 m diameter. At C, the pipe branches. Branch CD is 0.8 m in diameter and carries one third of the flow in AB. The flow velocity in branch CE is 2.5 m/s. Find the volume rate of flow in AB, the velocity in BC, the velocity in CD and the diameter of CE.	CO2	L4	6M
		OR			
4	a	Explain Momentum correction factor, Energy correction factor.	CO2	L2	4M
	b	The water is flowing through a pipe having diameter 20cm and 10cm at section 1 and 2 respectively. The rate of flow through pipe is 35 liters/s. The section 1 is 6 m above the datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm2 , Find the intensity of pressure at section 2.	CO2	L4	8M

UNIT-III

5		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.	CO3	L3	12M

OR

6	a	Explain pitot tube and pitot static tube.	CO3	L2	4M
	b	An oil of specific gravity 0.8 is flowing through a Venturi meter having inlet diameter of 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge of oil through a horizontal venturimeter. Take Cd = 0.98.	CO3	L4	8M

UNIT-IV

7	a	Explain the different types of hydroelectric power stations.	CO4	L2	6M
	b	Derive an expression for the hydraulic efficiency when a liquid jet strikes a single fixed curved vane.	CO4	L2	6M

OR

8		A jet of water having a velocity of 40 m/s strikes a curved vane, which is moving with a velocity of 20 m/s. The jet makes an angle of 30° with the direction of motion of vane at inlet and leaves at an angle of 90° to the direction of the motion of the vane at outlet. Draw the velocity triangles at inlet and outlet and determine the vane angles at inlet and outlet so that the water enters and leaves the vane without shock.	CO4	L4	12M

UNIT-V

9		Explain the working principle of a Pelton wheel with a neat sketch and also derive equation for hydraulic efficiency.	CO5	L2	12M

OR

10		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, ηo = 84 % ηh = 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 inlet and outlet, and (iv) Width of wheel at inlet.	CO5	L3	12M

***** END *****