MARRI LAXMAN REDDY
INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AN AUTONOMOUS INSTITUTION)
(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)
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II B.Tech II Sem Supply End Examination, March 2022
FLUID MECHANICS AND HYDRAULIC MACHINES
(MECH)

Time: 3 Hours.   Max. Marks: 70

Note: 1. Answer any FIVE questions.
      2. Each question carries 14 marks and may have a, b as sub questions.

1	a)	State and prove the Pascal's Law and also explain what do you understand by Hydrostatic law?	7M	CO1	BL1
	b)	A U-tube manometer is used to measure the pressure of water in a pipe line, which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of water in the main line, if the difference in level of mercury in the limbs of U-tube is 10 cm and the free surface of the mercury is in the level with the centre of the pipe. If the pressure of water in a pipe line is reduced to 9810 N/m². Calculate the new difference in the level of mercury. Sketch the arrangements in both the cases.	7M	CO1	BL3
2	a)	State and explain the Newton's law of viscosity. Deduce the expression for the dynamic viscosity.	7M	CO1	BL1
	b)	A plate having an area of 0.85m² is sliding down the inclined plane at 45⁰ to the horizontal with a velocity of 0.55 m/s. there is a cushion of fluid 2,5 mm thick between the plane and the plate. Find the viscosity of the fluid if the weight of the plate is 400 N	7M	CO1	BL3
3	a)	Explain the terms (i) Path line (ii) Streak line (iii) Stream line (iv) Stream tube (v) Steady flow (vi) Uniform flow (vii) Rotational flow	7M	CO2	BL1
	b)	The water is flowing through a pipe having diameters 20 cm and 10 cm at section 1 and section 2 respectively. The rate of flow through pipe is 35 litres/s. the section 1 is 6 m above 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?	7M	CO2	BL3
4	a)	State the momentum equation. How will you apply momentum equation for determining the force exerted by a floating liquid on a pipe bend?	7M	CO2	BL2
	b)	What do you mean by separation of boundary layer? What is the effect of pressure gradient on boundary layer separation?	7M	CO3	BL3

5	a)	A horizontal venturimeter with inlet and throat diameters 150 mm and 50 mm respectively is used to measure the flow of an oil of specific gravity 0.85. The oil mercury differential manometer shows a gauge difference of 250 mm. Calculate the discharge and Cd =0.99.	7M	CO3	BL2
	b)	How will you determine the loss of head due to friction in pipes by using (i) Darcy formula and (ii) Chezy's formula?	7M	CO3	BL4
6	a)	A Nozzle of 50 mm diameter delvers a stream of water at 20 m/s perpendicular to a plate that moves away from the jet at 5 m/s. Find 1) The force on the plate 2) The efficiency of the jet	7M	CO4	BL2
	b)	A hydraulic turbine is to develop 855.6 kW power when running at 100 r p m under a head of 10 m. Work out the maximum flow rate and specific speed for the turbine if the overall efficiency at the best operating point is 92%. In order to predict its performance, a 1:10 scale model is tested under a head of 6 m. what would be the speed, power, output and water consumption of the model if it runs under the similar conditions to the prototype?	7M	CO4	BL4
7	a)	Draw schematic diagram of Francis turbine and explain briefly its construction and working?	7M	CO4	BL3
	b)	The centrifugal pump delivers water against a net head of 14.5 meters and a design speed of 1000 rpm. The vanes are curved back to an angle of 30^0 with the periphery. The impeller diameter is 300 mm and outlet width is 50 mm. Determine the discharge of the pump if manometric efficiency is 95%.	7M	CO5	BL4
8	a)	Obtain an expression for the work done by impeller of a centrifugal pump on water per second per unit weight of water.	7M	CO5	BL2
	b)	A single acting reciprocating pump. Running at 50 rpm delivers 0.01 m^3/s of water. The diameter of the piston is 200mm and the stroke length 400 mm. determine (i) the theoretical discharge of the pump. (ii) Co-efficient of discharge. (iii) Slip and the percentage slip of eth pump.	7M	CO5	BL5

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