PVP 20

Code: 20ME3301

II B.Tech - I Semester – Regular/Supplementary Examinations
DECEMBER 2023

FLUID MECHANICS AND HYDRAULIC MACHINES
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
UNIT-I					
1	a)	Define pressure. Derive an expression for pressure at a point in a fluid at rest.	L2	CO1	7 M
	b)	A U-tube differential manometer connects two pressure pipes A and B. Pipe A contains carbon tetrachloride having a specific gravity 1.594 under a pressure of 11.772 N/cm^2 and pipe B contains oil of specific gravity 0.8 under a pressure of 11.772 N/cm^2. Pipe A lies 2.5 m above pipe B. Find the difference of pressure measured as fluid filling U-tube.	L2	CO1	7 M
OR					
2	a)	Explain the working of U- tube differential manometer.	L2	CO1	7 M

	b)	The dynamic viscosity of an oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4 m and rotates at 190 rpm. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.5 mm.	L2	CO1	7 M
		UNIT-II			
3	a)	Derive the one-dimensional continuity equation of fluid flow.	L2	CO2	7 M
	b)	Define the momentum principle. Write its applications.	L3	CO2	7 M
		OR			
4	a)	Derive Bernoulli's equation from Euler's equation of motion. State assumption made.	L3	CO2	7 M
	b)	A pipe line AB of diameter 300 mm and of length 400 m carries water at the rate of 50 lit/s. The flow takes place from A to B where point B is 30 m above. Find the pressure at A if the pressure at B is 19.62 N/cm^2. Take f = 0.008.	L2	CO2	7 M
		UNIT-III			
5	a)	What is an Orifice meter? Derive an expression for the discharge thorough an Orifice meter.	L3	CO3	7 M
	b)	A horizontal Venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of	L2	CO3	7 M

		water. The reading of differential manometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow. Take $C_d = 0.98$.			
OR					
6	a)	Derive an equation for force exerted by the jet of water strikes on fixed moving vertical plate.	L2	CO3	7 M
	b)	A jet of water of diameter 85 mm moving with a velocity of 35 m/s strikes a fixed plate in such a way that the angle between the jet and plate is 45^0. Find the force exerted by the jet on the plate (i) in the direction normal to the plate and (ii) in the direction of the jet.	L3	CO3	7 M
UNIT-IV					
7	a)	What is draft tube? Describe with neat sketches different types of draft tubes.	L2	CO4	7 M
	b)	What are unit quantities? Define the unit quantities of turbine.	L2	CO4	7 M
OR					
8	a)	Explain the working of Kaplan turbine with neat sketch.	L2	CO4	7 M
	b)	A turbine develops 9000 kW when running at a speed of 140 rpm and under a head of 30m. Determine the specific speed of the turbine.	L4	CO4	7 M

UNIT-V					
9	a)	Differentiate between single-stage and multistage pumps. Describe multistage pump with (i) impellers in parallel and (ii) impellers in series.	L2	CO5	7 M
	b)	Describe the principle and working of a reciprocating pump with a neat sketch.	L4	CO5	7 M
OR					
10	a)	Obtain an expression for the work done by impeller of a centrifugal pump on water per second per unit weight of water.	L3	CO5	7 M
	b)	Draw an indicator diagram, considering the effect of acceleration and friction in suction and delivery pipes. Find an expression for the work done per second.	L2	CO5	7 M