PVP 23

Code: 23ME3402

II B.Tech - II Semester – Supplementary Examinations
DECEMBER 2025

FLUID MECHANICS AND HYDRAULIC MACHINES
(MECHANICAL ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This question paper contains two Parts A and B.
2. Part-A contains 10 short answer questions. Each Question carries 2 Marks.
3. Part-B contains 5 essay questions with an internal choice from each unit. Each Question carries 10 marks.
4. All parts of Question paper must be answered in one place.

PART – A

1.a)	Write about compressibility.
1.b)	Define Capillarity.
1.c)	Classify fluid flows.
1.d)	State Reynolds transport theorem.
1.e)	List applications of bluff body.
1.f)	Define momentum thickness.
1.g)	Classify draft tubes.
1.h)	Define hydraulic efficiency.
1.i)	Write about NPSH in pumps.
1.j)	What is the significance of surge tank?

PART – B

			Max. Marks
		UNIT-I	
2	a)	With a neat sketch, discuss absolute, gauge and vacuum pressures.	5 M
	b)	The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm.	5 M
		OR	
3	a)	Calculate the capillarity in a glass tube of 3 mm diameter when immersed vertically in (i) water and (ii) mercury. Take surface tension for mercury and for water are 0.0725 N/m and 0.52 N/m respectively in contact with air.	5 M
	b)	Describe different types of Pressure measuring devices.	5 M
		UNIT-II	
4	a)	Derive friction factor for the flow through the circular pipe by Darcy Weisbach equation.	5 M
	b)	Write short notes on pipes in series and pipes in parallel.	5 M
		OR	

5	a)	Water is flowing through a pipe having diameter 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.5 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2. Determine the difference in datum head if the rate of flow through pipe is 40 lit/s.	5 M
	b)	Distinguish between total energy line-hydraulic gradient lines.	5 M
		UNIT-III	
6	a)	Show that for velocity distribution, $\frac{u}{U} = 2\left(\frac{y}{\delta}\right) - \left(\frac{y}{\delta}\right)^2$, the ratio of $\delta/\ \delta^* = 3$.	5 M
	b)	List out various dimensionless numbers. Explain them in detail.	5 M
		OR	
7	a)	Explain Buckingham Pi theorem.	5 M
	b)	A thin plate is moving in atmospheric air at a velocity of 4 m/s. the length of plate is 0.5 m and width is 0.4 m. calculate (i) Thickness of the boundary at the end of the plate and (ii) Drag force on one side of the plate.	5 M
		UNIT-IV	
8	a)	Differentiate between Impulse turbine and Reaction turbine.	5 M
	b)	Derive the equation for impact of jet striking a curved plate at one tip and leaving at the other tip, when the plate is stationary.	5 M

		OR	
9	a)	A jet of water moving at 12 m/s impinges on vane shaped to deflect the jet through 120° when stationary. If the vane is moving at 5 m/s, find the angle of the jet so that there is no shock at inlet. What is the absolute velocity of the jet at exit in magnitude and direction and the work done per second per unit weight of water striking per second? Assume that the vane is smooth.	5 M
	b)	Explain the working of Pelton wheel turbine with neat diagram.	5 M
		UNIT-V	
10	a)	Explain the governing of the hydraulic turbine.	5 M
	b)	Differentiate between reciprocating pump and centrifugal pump.	5 M
		OR	
11	a)	Draw and discuss characteristic curves of hydraulic turbine.	5 M
	b)	A centrifugal pump having outer diameter equal to two times the inner diameter and running at 1000 r.p.m. works against a total head of 40 m. the velocity of flow through the impeller is constant and equal to 2.5 m/s. The vanes are set back at an angle of 40° at outlet. If the outer diameter of the impeller is 500 mm and width at outlet is 50 mm. Determine: (i) Vane angle at inlet and (ii) Work done by impeller on water per second.	5 M