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BME403

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2025
Fluid Mechanics

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Define the following fluid properties, i) Density ii) Specific weight iii) Specific gravity iv) Specific volume v) Viscosity.	15	L1	CO1
	b.	With diagram, explain simple manometer.	5	L2	CO1
		OR			
Q.2	a.	Define : i) Total pressure ii) Centre of pressure.	4	L1	CO1
	b.	The pressure intensity at a point in a fluid is given as 3.924 N/cm^2. Find the corresponding height of fluid when the fluid is : i) water ii) oil of specific gravity = 0.9.	6	L5	CO1
	c.	The weight of 5.024 liters of oil is 62.8 N calculate : i) Specific weight of oil ii) Density of oil iii) Specific gravity of oil iv) Specific volume.	10	L5	CO1
		Module – 2			
Q.3	a.	Distinguish between : i) Uniform flow and non uniform flow ii) Steady flow and unsteady flow iii) Laminar flow and turbulent flow.	12	L2	CO3
	b.	The diameter of a pipe at section A and B are 8 cm and 12 cm respectively. If velocity of water flowing through the pipe at section. A is 2 m/sec. Determine the discharge through the pipe, and the velocity at section B.	8	L4	CO3

		OR			
Q.4	**a.**	Define : i) Velocity potential function ii) Stream function.	**6**	**L1**	**CO3**
	b.	The velocity components in a flow are given by : U = 6y and v = 6x. Find : i) Whether the flow is possible ii) Stream function ψ.	**8**	**L4**	**CO3**
	c.	Define flow net, state its uses.	**6**	**L1**	**CO3**
		Module – 3			
Q.5		Derive Euler's equation of motion and obtain Bernoulli's equation from Euler's equation of motion.	**20**	**L5**	**CO4**
		OR			
Q.6	**a.**	Derive an expression for discharge through a venturimeter.	**10**	**L5**	**CO4**
	b.	A vertical venturimeter has an area ratio of 5. It has a throat diameter of 10 cm. When oil of specific gravity 0.8 flows through it, the mercury in the differential gauge indicates a difference in height of 12 cm. Find the discharge through venturimeter. Take $C_d = 0.98$.	**10**	**L4**	**CO4**
		Module – 4			
Q.7	**a.**	Define with diagram : i) Stream line body ii) BLUFF body.	**6**	**L1**	**CO5**
	b.	A circular disc of 4 m in diameter is held normal to a 30 m/sec wind of density 0.0012 gm/cc. What force is required to hold it at rest? Assume co-efficient fog rag of disc = 1.1.	**6**	**L4**	**CO5**
	c.	A man descends to the ground from an aeroplane with the help of a parachute which is hemispherical having a diameter of 4 m against the resistance of air with a uniform velocity of 25 m/sec. Find the weight of the man, if the weight of the parachute is 9.81 N. Take co-efficient of drag as 0.6.	**8**	**L4**	**CO5**
		OR			
Q.8	**a.**	Mention the advantages and applications of dimensional analysis.	**10**	**L1**	**CO6**
	b.	A partially submerged body is towed in water the resistance R to its motion depends on the density (ρ), the viscosity (μ) of water, length (τ) of the body, velocity (v) of body and acceleration due to gravity (g). Show that the resistance to the motion can be expressed in the form : $R = \rho L^2 V^2 \phi\left[\left(\frac{\mu}{\rho VL}\right).\left(\frac{\tau g}{V^2}\right)\right]$.	**10**	**L4**	**CO6**

		Module – 5			
Q.9	**a.**	Obtain an expression for velocity of sound in terms of bulk modulus for a compressible fluid.	**10**	**L5**	**CO6**
	b.	A projectile travels in air of pressure 15 N/cm^2 at 10°C at a speed of 1500 KM/hour. Find : i) Mach number ii) Mach angle Assume adiabatic constant $\gamma = 1.4$ and gas constant, R = 2875/kg°K.	**8**	**L4**	**CO6**
	c.	Define SONIC flow.	**2**	**L1**	**CO6**
		OR			
Q.10	**a.**	Define computational fluid dynamics, state its limitations and applications.	**12**	**L2**	**CO7**
	b.	Define Mach number, obtain an expression for the same.	**8**	**L4**	**CO7**

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