Reg. No.															

Question Paper Code	13459

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2025

Third Semester

Civil Engineering

20CEPC303 - FLUID MECHANICS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which of the following best defines a fluid? (a) A substance that has a fixed shape and resists shear stress (b) A substance that deforms continuously under the action of shear stress (c) A substance that can neither flow nor deform (d) A solid material that cannot change its shape	1	K1	CO1
2.	The continuum hypothesis assumes that: (a) Fluids have uniform properties at all scales (b) Fluids are made up of discrete molecules (c) Fluid properties like density and pressure vary smoothly (d) Fluids can be considered incompressible under all conditions	1	K1	CO1
3.	A manometer measures the pressure difference by: (a) Calculating the flow rate (b) Measuring height difference of liquid columns (c) Measuring velocity head (d) Directly reading the pressure on a dial	1	K1	CO2
4.	Which of the following is true for a fluid at rest? (a) There is no shear stress (b) The velocity is maximum (c) The fluid is undergoing steady flow (d) The pressure varies in all directions	1	K1	CO2
5.	A streamline is defined as: (a) The path traced by a fluid particle over time (b) A line that is tangent to the velocity vector of the fluid at every point (c) A line along which the pressure is constant (d) A line representing fluid velocity magnitude	1	K1	CO3
6.	Bernoulli's equation is based on the principle of conservation of: (a) Mass (b) Energy (c) Momentum (d) Volume	1	K1	CO3
7.	Which of the following are fundamental dimensions? (a) Mass, Length, Time (b) Force, Energy, Power (c) Pressure, Velocity, Density (d) Temperature, Pressure, Volume	1	K1	CO4
8.	Rayleigh's method is primarily used for: (a) Dimensional analysis (b) Fluid statics (c) Turbulent flow calculations (d) Viscosity measurements	1	K1	CO4
9.	Laminar flow is characterized by: (a) High velocity and chaotic fluid motion (b) Smooth and orderly fluid motion (c) Significant turbulence and mixing (d) Low viscosity fluids only	1	K2	CO5
10.	The momentum integral equation is derived from which fundamental principle? (a) Conservation of mass (b) Newton's second law (c) Conservation of energy (d) Continuity equation	1	K1	CO6

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

		Marks	K – Level	CO
11.	Summarize the scope of fluid mechanics.	2	K2	CO1
12.	Define Specific Volume.	2	K1	CO1

13.	State the relation between Absolute pressure and Gauge pressure.	*2*	*K1*	*CO2*
14.	Define Buoyancy.	*2*	*K1*	*CO2*
15.	What is mean by Flow net?	*2*	*K1*	*CO3*
16.	Interpret the application to pipe bend.	*2*	*K2*	*CO3*
17.	Define dimensional homogeneity.	*2*	*K1*	*CO4*
18.	Outline the term undistorted model.	*2*	*K2*	*CO4*
19.	What is the difference between laminar flow and viscous flow?	*2*	*K1*	*CO5*
20.	What are major and minor energy losses? Why it is called so?	*2*	*K2*	*CO5*
21.	List out the different methods of preventing the separation of boundary layers.	*2*	*K1*	*CO6*
22.	Write short notes on boundary layers.	*2*	*K1*	*CO6*

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a) (i)	Illustrate the control volume approach.	*6*	*K2*	*CO1*
	(ii)	Determine the specific weight, density and specific gravity of one liter of a liquid which weighs 7 N.	*5*	*K2*	*CO1*
		OR			
	b)	Illustrate the properties of fluids and Explain any four properties of fluids.	*11*	*K2*	*CO1*
24.	a)	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 mercury is in level with the centre of the pipe. If the pressure of water in pipe line is reduced to 9810 N/ m^2, Calculate the new difference in the level of mercury. Sketch the arrangements in both cases.	*11*	*K3*	*CO2*
		OR			
	b)	A wooden log of 0.6 m diameter and 5 m length is floating in river water. Calculate the depth of the wooden log in water when the specific gravity of the log is 0.7.	*11*	*K3*	*CO2*
25.	a)	In a two – two dimensional incompressible flow, the fluid velocity components are given by u = x – 4y and v = - y – 4x. Show that velocity potential exists and determine its form. Find also the stream function.	*11*	*K3*	*CO3*
		OR			
	b)	State Bernoulli's theorem for steady flow of an incompressible fluid. Derive an expression for Bernoulli's equation from first principle and state the assumptions made for such a derivation.	*11*	*K3*	*CO3*
26.	a)	Discuss about Buckingham's π theorem. State the procedure for solving the problems.	*11*	*K2*	*CO4*
		OR			
	b)	Illustrate the different types of models with merits and demerits.	*11*	*K2*	*CO4*
27.	a)	Derive Hagen – Poiseulle's equation for viscous flow through a circular pipe.	*11*	*K3*	*CO5*
		OR			

	b)	A horizontal pipeline 40m long is connected to a water tank at one end and discharges freely into the atmosphere at the other end. For the first 25m of its length from the tank, the pipe is 150mm diameter is suddenly enlarged to 300mm. the height of water level in the tank is 8m above the centre of the pipe. Considering all losses of head, which occur? Determine the rate of flow. Take f = 0.01 for both sections of the pipe.	*11*	*K3*	*CO5*
28.	a)	Derive an expression for the displacement thickness and momentum thickness in boundary layer with the necessary assumption.	*11*	*K3*	*CO6*
		OR			
	b)	Derive an expression for the Vonkarman momentum integral equation for the boundary layer.	*11*	*K3*	*CO6*