Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Third Semester

Civil Engineering

CE3301 - Fluid Mechanics

Regulations - 2021

Duration : 3 Hrs *Maximum: 100 Marks*

*PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)*

Q.No	*Questions*	*BLT*	*CO*	*Marks*
1.	Define the term specific gravity.	RE	1	2
2.	Identify conditions for the equilibrium of floating and submerged bodies.	UN	1	2
3.	List the assumptions made in deriving Bernoulli's equation.	RE	2	2
4.	Differentiate between steam line and path line.	UN	2	2
5.	Compare distorted and undistorted models.	UN	3	2
6.	Distinguish between Rayleigh's method and Buckingham's π Theorem.	UN	3	2
7.	What is meant by hydraulic gradient line?	RE	4	2
8.	Categorize major and minor losses encountered in pipe flow.	UN	4	2
9.	Define boundary layer.	RE	5	2
10.	Mention the applications of momentum integral equation.	UN	5	2

*PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)*

Q.No			*Questions*	*BLT*	*CO*	*Marks*
11.	a	i	A solid cylinder of diameter 5m has a height of 4m.Identify the metacentric height of the cylinder when it is floating in water with its axis vertical. The specific gravity of the cylinder is 0.6.	AP	1	7
		ii	Discover the specific weight, mass density and specific volume of 2 litres of petrol weighs 13N.	AP	1	6
			Or			
	b	i	List and discuss the different types of fluids.	RE	1	7
		ii	Distinguish between U-Tube differential manometer and Inverted U-Tube differential Manometer.	UN	1	6

12.	a	Define Bernoulli's theorem for a steady flow of an incompressible fluid and Derive an expression for Bernoulli's equation from first principle.	UN	2	13
		Or			
	b	What do you mean by momentum equation? How will you apply momentum equation for determining the force exerted by a flowing liquid on a pipe bend?	UN	2	13
13.	a	State Buckingham's π theorem and explain the various similarities in detail.	AP	3	13
		Or			
	b	A spillway model is to be built to a scale ratio of 1:40 across a flume of 600 mm width. The prototype is 10m high and maximum head expected is 1.5 m. (i) Calculate the height of the model and the head on the model. (ii) Calculate the flow over the prototype when the flow over the model is 12lps. (iii) If a negative pressure of 0.15m Occurs in the model. What will be negative pressure in the prototype? Is this practically possible to occur.	AP	3	13
14.	a	Three pipes of the same length L, diameter D, and friction factor f are connected in parallel. Identify the diameter of the pipe of length L and friction factor f which will carry the same discharge for the same head loss. Use Darcy's formula for head loss due to friction	AP	4	13
		Or			
	b	A liquid flow through a short pipe which branches into two parallel pipes A and B each with a line of 50m and with inside diameters of 25mm and 50mm respectively. The ends of the pipes are connected together by another short pipe. Analyze the flow through each pipe if they have a drop in elevation of 3m. Assume a constant Manning's friction factor in both pipes of 0.005.	AP	4	13
15.	a	Explain the concept of Boundary layer formation, and also derive the expression for Displacement thickness.	AP	5	13
		Or			
	b	A flat plate 1.5m x 1.5m moves at 50km/h in a stationary air of density 1.15kg/m^3. If the coefficient of drag and lift are 0.15 and 0.75 respectively. Determine the following: (i) The lift force (3) (ii) The drag force (4) (iii) The resultant force (3) (iv) The power required to set the plate in motion.(3)	AP	5	13

*PART – C (Marks 1*15 = 15)*

Q.No		*Questions*	*BLT*	*CO*	*Marks*
16.	a	The resisting force (F) of a supersonic plane during flight can be considered as dependent upon the length of the aircraft (L), Velocity (V), Air viscosity (μ), Air density (ρ) and Bulk modulus (k). Express the functional relationship between these variables and the resisting force using dimensional analysis method.	AP	3	15
		Or			
	b	A flat plate of length 800mm and 200mm width has been placed longitudinally in a stream of oil which flows with a velocity of 4m/s. The specific gravity of oil is 0.88 and viscosity is 1.25 poise. Find (i) Boundary layer thickness and shear stress at the middle of plate (8) (ii) Friction drag on both sides of the plate (7)	AP	5	15