Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 170002

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2025
Third Semester
Civil Engineering
U23CE302 – MECHANICS OF FLUIDS
(Regulation 2023)

Time: Three Hours | Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 - Evaluating
	K2 – Understanding	K4 – Analyzing	K6 - Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	Classify the types of fluids and state few examples for the real fluids.	2	K1	CO1
2.	Calculate the height of capillary rise for water in a glass tube of diameter 1 mm.	2	K2	CO1
3.	State the assumptions made in the derivation of Bernoulli's Equation.	2	K1	CO2
4.	Relate stream function and velocity potential function.	2	K2	CO2
5.	Mention the causes for major and minor loss in pipes.	2	K2	CO3
6.	Differentiate laminar and turbulent flow.	2	K2	CO3
7.	Write the expression to determine the head loss at the entrance of the pipe.	2	K1	CO4
8.	List the conditions for separation of boundary layer.	2	K2	CO4
9.	Check whether the equation. $v= \sqrt{(2gH)}$, is dimensionally homogenous.	2	K2	CO5
10.	List various model laws applied in model analysis	2	K1	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	If the velocity profile of a fluid over a plate is a parabolic with the vertex 0.2 m from the plate, where the velocity is 1.2m/s. Calculate the velocity gradients and shear stresses at a distance of 0m, 0.1m and 0.2m from the plate, if the viscosity of the fluid is 8.5 poise.	13	K3	CO1
		(OR)			
	b)	A rectangular plate 0.6m wide and 1.2 m deep lies within a water body such that its plane is inclined at 45 degree to the horizontal and the top edge is 0.70 m below the water surface. Determine the total pressure on one side of the plate and the location of the centre of pressure.	13	K3	CO1
12.	a)	For the following flow find the equation of the stream line passing through (2,2) i. $F = 3xi - 3yj$ ii. $F = -y^2i - 6xj$	13	K3	CO2
		(OR)			
	b)	A pipe line carrying oil, has a diameter of 300mm at position 1 to 600mm diameter at position 2 which is 5m at a higher level. The pressures at position 1 and 2 are 100kN/m^2 and 60kN/m^2 respectively and the discharges is 300 litre / sec. Determine loss of head and Direction of flow.	13	K3	CO2
13.	a)	The rate of flow of water through a horizontal pipe is 0.25 m^3/s. The diameter of the pipe which is 200 mm is suddenly enlarged to 400 mm. The pressure intensity in the smaller pipe is 11.772 N/cm^2 Determine : i. loss of head due to sudden enlargement, ii. pressure intensity in the large pipe, iii. power lost due to enlargement.	13	K3	CO3
		(OR)			
	b)	Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water is flowing at a velocity of 3 m/s using (i) Darcy formula, (ii) Chezy's formula for which C = 60. Take n for water = 0.01 stoke.	13	K3	CO3
14.	a)	A plate of length 750 mm and width 250 mm has been placed longitudinally in a stream of crude oil which flows with a velocity of 5 m/s. If the crude oil has a specific gravity of 0.8 and kinematic viscosity of 1 stoke, Estimate: i)Boundary layer thickness at the middle of the plate. ii)Shear stress at the middle of the plate. iii) Friction drag on one side of the plate.	13	K3	CO4

(OR)

	b)	For the velocity profile $u/U = 2 (y/ \delta) - (y/ \delta)^2$, find the thickness of boundary layer at the end of the plate and the drag force on one side of a plate 1 m long and 0.8 m wide when placed in water flowing with a velocity of 150 mm/sec. Calculate the value of co - efficient of drag also. Take μ for water = 0.01 poise.	13	K3	CO4
15.	a)	A ship is 300 m long moves in sea water, whose density is 1030 kg/m^3. A 1:100 model of this to be tested in a wind tunnel. The velocity of air in the wind tunnel around the model is 30 m/s and the resistance of the model is 60 N. Determine the velocity of ship in sea water and also the resistance of the ship in sea water. The density of air is given as 1.24 kg/m^3. Take the Kinematic viscosity of sea water and air as 0.012 stokes and 0.018 stokes respectively.	13	K3	CO5
		(OR)			
	b)	In an aeroplane model of size 1/10 of its prototype the pressure drop is 7.5 kg/m^3. The model is tested in water. Find the corresponding pressure drop in the prototype. Take density of air is 1.4 kg/m^3, density of water is 1000 kg/m^3, viscosity of air is 0.00018 poise and viscosity of water is 0.01 poise	13	K3	CO5

PART – C

(1 x 15 = 15 Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	State Bernoulli's theorem for steady flow of an incompressible Fluid. Derive an expression for Bernoulli's equation from first principle and state the assumption made for such a derivation.	15	K3	CO2
		(OR)			
	b)	12000 kW power is required to cruise a passenger ship of 300m length and 12.0 m draft at 40km/hr. If density is 1030 kg/m^3 and $v = 1x10^{-4}$ m^2/s, determine the combined force and wave resistance of the ship.	15	K3	CO4