Reg. No.												

Question Paper Code	11701

B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV/DEC 2022

Third Semester

Civil Engineering

20CEPC303 - FLUID MECHANICS

(Regulations 2020)

Duration: 3 Hours

Max. Marks: 100

PART - A (10 × 2 = 20 Marks)

Answer ALL Questions

		Marks, K-Level, CO
1.	State Newton's Law of Viscosity.	*2,K1,CO1*
2.	What is meant by buoyancy?	*2,K1,CO1*
3.	List out the various types of flow.	*2,K1,CO3*
4.	Write down the assumptions for the Bernoulli's equation.	*2,K2,CO3*
5.	State Buckingham's π –theorem.	*2,K1,CO4*
6.	Classify model.	*2,K2,CO4*
7.	Differentiate between laminar and turbulent flow.	*2,K2,CO5*
8.	List out the loss of energy due to change of velocity in a pipe.	*2,K1,CO5*
9.	Draw the sketch of the effect of pressure gradient on boundary layer separation.	*2,K2,CO6*
10.	Differentiate between drag and lift.	*2,K2,CO6*

PART - B (5 × 13 = 65 Marks)

Answer ALL Questions

11.	a)	(i) Two plates are placed at a distance of 0.15 mm apart. The lower plate is fixed While the upper plate having surface area 1.0 m^2 is pulled at 0.30 m/s. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity 1.50 poise	*8,K2,CO1*
		(ii) Calculate the capillary rise in a glass tube of 3.0 mm diameter when immersed vertically in (1) water, and (2) mercury. Take surface tensions for mercury and water as 0.0725 N/m and 0.52 N/m respectively in contact with air, Specific gravity for mercury is given as 13.6.	*5,K2,CO1*
		OR	
	b)	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 water and mercury is in the left limb.	*13,K2,CO1*

Determine the pressure of water in the main line, if the difference in level of mercury in the limbs U. U tube is 10 cm and the free surface of mercury is in level with over 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 arrangement in both cases.

12. a) (i) For a three dimensional flow the velocity distribution is given by $u = -x$, $v = 3-y$ and $w = 3-z$. What is the equation of a streamline passing through (1, 2, 2)? *10,K2,CO3*

(ii) Define and explain briefly the following a) Velocity potential b) Stream function. *3,K2,CO3*

OR

b) State and prove Bernoulli's equation. *13,K2,CO3*

13. a) Derive on the basis of dimensional analysis suitable parameters to present the thrust developed by a propeller. Assume that the thrust P depends upon the angular velocity ω, speed of advance V, diameter D, dynamic viscosity μ, mass density ρ, elasticity of the fluid medium which can be denoted by the speed of sound in the medium C. *13,K2,CO4*

OR

b) A 7.2 m height and 15 m long spillway discharges 94 m^3/s discharges under a head of 2.0 m. If a 1:9 scale model of this spillway is to be constructed, determine model dimensions, head over spillway model and the model discharge. If model experiences a force of 7500 N, determine force on the prototype. *13,K2,CO4*

14. a) A pipeline of 600 mm diameter is 1.5 km long. To increase the discharge another line of the same diameter is introduced parallel to the first in the second-half of the length. If $f = 0.01$ and head at inlet is 300 mm. calculate the increase in discharge. Neglect minor losses. *13,K2,CO5*

OR

b) The difference in water surface levels in two tanks, which are connected by three pipes in series of lengths 300 m, 170 m and 210 m and of diameters 300 mm, 200 mm and 400 mm respectively, is 12 m. Determine the rate of flow of water if co-efficient of friction are 0.005, 0.0052 and 0.0048 respectively, considering: (i) minor losses also. (ii) Neglecting minor losses. *13,K2,CO5*

15. a) Derive an expression for the Von Karman momentum integral equation for the boundary layer. *13,K2,CO6*

OR

b) (i) Explain the laminar and turbulent boundary layers. *10,K2,CO6*

(ii) Obtain an expression for the boundary layer shear stress in terms of momentum thickness. *3,K2,CO6*

PART - C (1 × 15 = 15 Marks)

16. a) Derive an expression for depth of center of pressure from the free surface of liquid of an inclined plane surface submerged in the liquid. *15,K2,CO2*

OR

b) A circular plate 1.2m diameter is placed vertically in water, so that the center of plate is 2m below the free surface. Determine the total pressure and the depth of center of pressure. The above circular plate is taken out of water and made into a solid cylindrical body which weighs 4.5 N in water and 6 N in oil of specific gravity 0.8. Find the volume and weight of the body. Find also the density and specific gravity of the material of the body. *15,K2,CO2*