Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2025

Third Semester

Chemical Engineering

CH3352 - Fluid Mechanics for Chemical Engineers

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 ideal plastic fluid.	L1	1	2
2.	Differentiate kinematic viscosity with dynamic viscosity.	L2	1	2
3.	Write in short about 'Vortex flow'.	L1	2	2
4.	Compare stream line and path line.	L2	2	2
5.	State the significance of Weber's model law.	L1	3	2
6.	Classify three types of similitude.	L1	3	2
7.	What is meant by boundary layer separations?	L2	4	2
8.	Write down Hagen-Poiseuille equation for laminar flow.	L2	4	2
9.	Define Venturimeter.	L1	5	2
10.	List out various losses in centrifugal pump.	L2	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No		*Questions*	*BLT*	*CO*	*Marks*
11.	a	Explain the characteristics and significance of Newtonian and non-Newtonian fluids with some examples.	L3	1	16
		Or			
	b	Discuss various types of fluid motions along with their basic properties.	L3	1	16
12.	a	A differential manometer is connected at the two points A and B of two pipes as shown in below figure-12.a. The pipe A contains a liquid of specific gravity 1.5 while pipe B contains a liquid of specific gravity 0.9. The pressures at A and B are 1 kgf/cm^2 and 1.80 kgf/cm^2 respectively. Find the difference in mercury level in the differential manometer.	L3	2	16

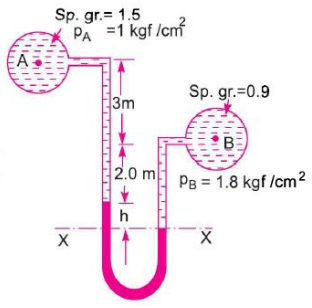

Figure -12.a.

Or

	b	Derive the continuity equation in cylindrical polar co-ordinates.	L3	2	16
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*.	L4	3	16
		Or			
	b	The ratio of lengths of a sub-marine and its model is 30:1. The speed of sub-marine (Prototype) is 10 m/s. The model is to be tested in a wind tunnel. Find the speed of air in wind tunnel. Also determine the ratio of the drag (resistance) between the model and its prototype. Take the value of kinematic viscosities for a sea water and air as 0.012 stokes and 0.16 stokes respectively. The density for sea water and air is given as 1030 kg/m^3 and 1.24 kg/m^3 respectively.	L4	3	16
14.	a	Three pipes of diameters 300 mm, 200 mm and 400 mm and lengths 450 m, 255 m and 315 m respectively are connected in series. The difference in water surface levels in two tanks is 18 m. Determine the rate of flow of water if coefficients of friction are 0.0075, 0.0078 and 0.0072 respectively considering: (a) Minor losses also and (b)Neglecting minor losses.	L4	4	16
		Or			
	b	For the velocity profile in laminar boundary layer as $\frac{u}{U} = \frac{3}{2}\left(\frac{y}{\delta}\right) - \frac{1}{2}\left(\frac{y}{\delta}\right)^3$. Find the thickness of the boundary layer and shear stress, 1.5 m from the leading edge of a plate. The plate is 2 m long and 1.4 m wide is placed in water, which is moving with a velocity of 200 mm/sec. Find the total drag force on the plate if μ for water 0.01 poise.	L4	4	16
15.	a	The head of water over an orifice of diameter 100 mm is 10 m. The water coming out from orifice is collected in a circular tank of diameter 1.5 m. The rise of water level in this tank is 1.0 m in 25 seconds. Also the coordinates of a point on the jet, measured from vena-contracta are 4.3 m horizontal and 0.5 m vertical. Find the co-efficients, C_d, C_v and C_c.	L4	5	16
		Or			
	b	Illustrate about the concept of sizing of pumps and compressors with some real time case examples.	L4	5	16