## Code No: P21CET02

## PACE INSTITUTE OF TECHNOLOGY & SCIENCES::ONGOLE (AUTONOMOUS) II B.TECH I SEMESTER END SUPPLEMENTARY EXAMINATIONS, MARCH/APRIL - 2023 FLUID MECHANICS (CE Branch)

Time: 3 hours

Max. Marks: 70

## Answer all the questions from each UNIT (5X14=70M)

Q.No.		Questions	Marks	CO	KL			
UNIT-I								
1.	a)	Explain the phenomena surface capillarity. Obtain an expression for capillarity rise of a liquid.	[7M]	1	3			
	b)	Fig. shows a U-tube differential manometer connecting two pressure pipes at A and B contains a liquid of specific gravity 1.5 under a pressure of 115 kN/m <sup>2</sup> . The pipe B contains oil of specific gravity 0.9 under a pressure of 220 kN/ m <sup>2</sup> Find the difference of pressure measured by mercury as fluid filling U-tube.	[7M]	1	2			
		OR						
2.	a)	State and prove the Pascal's law	[7M]	1	3			
	b)	Determine the total pressure and depth of center of pressure on a plane rectangular surface of 3.5m wide and 4.5m deep when its upper edge is horizontal and (i) coincides with water surface (ii) 2.5 m below the free surface of water.	[7M]	1	4			
		UNIT-II						
3.	a)	Distinguish between: (i).Stream line and Path line (ii). Streak line and Stream tube (iii). Laminar flow and Uniform flow.	[7M]	2	2			
	b)	The velocity potential function ( $\phi$ ) is given by an $\varnothing = -\left(\frac{xy^3}{3}\right) - x^2 + \left(\frac{x^3y}{3}\right) + y^2$ (i)Find the velocity components in x and y directions.	[7M]	2	4			
OR								
4.	a)	State and derive three dimensional (3D) continuity equation for incompressible fluid.	[10M]	2	3			

Code	No:	P21CET02			
	b)	The diameter of a pipe at the section 1-1 and 2-2 are 150 mm and 300 mm respectively. If the velocity of water flowing through the pipe at section 1-1 is 3 m/s, find (i). Discharge through the pipe and (ii). Velocity of water at section 2-2.	[4M]	2	4
		UNIT-III			
5.	a)	Draw a neat sketch of Reynolds apparatus and explain how the laminar flow can be demonstrated with the help of the apparatus.	[7M]	3	3
	b)	Derive the expression for the loss of head in a pipe due to friction?	[7M]	3	3
		OR			1
6.	a)	What do you understand by the total energy line, hydraulic gradient line, pipes in series, pipes in parallel and equivalent pipe?	[7M]	3	2
	b)	Explain the procedure of pipe net work problems by using Hard-Cross Method.	[7M]	3	3
		UNIT-IV			L
7.	a)	Explain the principle of orifice meter with neat sketch? Derive an expression for the rate of flow of fluid through it.	[10M]	4	2
	b)	Explain the fallowing terms (i). Coefficient of velocity (ii). coefficient of contraction (iii). coefficient of Discharge (iv). Vena-contracta	[4M]	4	2
		OR			
8.	a)	Derive an expression for the discharge over a Triangular notch in terms of head of water over the crest of the notch.	[7M]	4	3
	b)	Water flows through a rectangular notch of 2.5 m width and depth of water over the notch is 500 mm, find discharge of the rectangular notch. Take coefficient of discharge is 0.6.	[7M]	4	4
		UNIT-V			
9.	a)	Derive an expression for the displacement thickness	[7M]	5	2
	b)	Explain the phenomenon of separation of boundary layer with a neat sketch	[7M]	5	3
		OR			
10.	a)	Obtain Von Karman momentum integral equation	[7M]	5	3
	b)	Find the displacement thickness and the momentum thickness for velocity distribution in the boundary layer given by $\frac{u}{tt} = 2\left(\frac{y}{s}\right) - \left(\frac{x^2}{s^2}\right)$	[7M]	5	4

\*\*\*\*\*