set II

Total No. of Questions – [8]

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MAY 2019/ENDSEM REEXAM

S. Y. B. TECH. (Civil) (SEMESTER - II)

COURSE NAME: Fluid Mechanics - I

COURSE CODE: CVUA 22173

(PATTERN 2017)

Time: [**2 Hours**]

[Max. Marks: **50**]

(*) Instructions to candidates:

1) **Answer Q.1, Q.2, Q.3, Q.4, Q.5 OR Q.6, Q.7 OR Q.8**
2) **Figures to the right indicate full marks.**
3) **Use of scientific calculator is allowed**
4) **Use suitable data where ever required**

Q.1)	a)	Using Buckingham π theorem, prove that the discharge over weir is given by $Q = VL^2\phi\left(\frac{\sqrt{g}L}{V}, \frac{H}{L}\right)$	6
		OR	
	b)	Derive equation for pressure inside a liquid jet of radius R and surface tension σ as well as expression for determining relation between pressure inside the droplet of liquid and surface tension.	6
Q.2)	a)	A circular plate of 2m in diameter is submerged in water such hat its greatest and least depths below the free surface are 3.5m and 2m respectively. Find the total pressure on one face of the plate and depth of center of pressure.	6
		OR	
	b)	A wooden block 50cm long, 25cm wide and 18cm deep has its shorter axis vertical with the depth of immersion 15cm. Calculate the position of metacenter and comment on stability of block.	6
Q.3)	a)	What is flow net? What are the methods of drawing flow net? Explain electrical analogy method for drawing flow net	6
		OR	
	b)	Obtain a stream function to the following velocity components: u=x+y and v=x-y.	6

Q.4)	a)	Define i) orifice ii) coefficient of contraction iii) coefficient of discharge and iv) coefficient of velocity.	4
		OR	
	b)	A pitot static tube is used to measure velocity of an airplane. U-Tube differential manometer gives deflection of 5cm of water. If specific weight of air is 11.75N/m3 and coefficient of pitot tube is 0.98. Determine speed of airplane.	4
Q.5)	a)	Prove the relation between shear and pressure gradients for laminar flow	6
	b)	A viscous liquid of R.D. 0.9 and kinematic viscosity 2.9 $\times 10^{-4}$ m^2/s flows through a horizontal pipe 100 mm diameter. Velocity along the axis is 1.85 m/s. Find (a) shear stress along the pipe surface in Pa (b) Discharge	4
	c)	Explain growth of boundary layer over a flat plate	4
		OR	
Q.6)	a)	Derive equation for velocity distribution of laminar flow through a circular pipe	6
	b)	A smooth 2 dimensional flat plate is exposed to wind velocity of 300 kmph. If laminar boundary layer exists up to Re = 3 x 10^5 find the maximum distance up to which laminar boundary layer persists and its maximum thickness. kinematic viscosity 1.5 $\times 10^{-5}$ m^2/s	4
	c)	Calculate displacement thickness and momentum thickness of boundary layer for velocity distribution of $\frac{u}{U} = \left(\frac{y}{\partial}\right)^{1/7}$	4
Q.7)	a)	Following are details of a system of three pipes connected in parallel. Calculate total discharge through all the pipes if the discharge through pipe 1 is 150l/s	6

Pipe	L (m)	D(mm)	f
1	300	250	0.02
2	250	200	0.025
3	450	150	0.03

	b)	Describe Prandtl mixing length theory for finding the shear stress in Turbulent flow	4
	c)	What is siphon? On what principle does it work? Explain	4
		OR	
Q.8)	a)	Derive Darcy Weisbach equation	6
	b)	What is eddy viscosity? How does it differ from the dynamic viscosity?	4
	c)	State any four characteristics of turbulent flow	4