

Total No. of Questions – [8]

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MAY 2019/ENDSEM

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)	A U tube is made up of two capillary tubes; one 2 mm and other 4 mm in diameter. The tube is vertical and partially filled with water of surface tension 0.0736 N/m and zero angle of contact. Calculate the difference of levels in the tube.	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)	Determine pressure difference between A and B and A and C in terms of kN/m^2	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)	Define rotation. Write equations for components of rotation. Prove that vorticity is equal to twice the rotation component per unit area	6												
Q.4)	a)	Find out discharge through a Venturimeter with inlet diameter of 10 cm and throat diameter of 5 cm carrying oil of specific gravity 0.8 when the deflection of oil mercury manometer is 30 cm. Assume coefficient of the meter as 0.95	4												
OR															
	b)	Define i) orifice ii) coefficient of contraction iii) coefficient of discharge and iv) coefficient of velocity.	4												
Q.5)	a)	A smooth flat plate is exposed to wind velocity of 6 km/minute. If the laminar boundary exists upto a value of $Re=2 \times 10^6$ find the maximum distance upto which laminar boundary layer exists and its maximum thickness. Assume kinematic viscosity of air = $1.5 \times 10^{-5} \text{ m}^2/\text{s}$	6												
	b)	Define nominal thickness, displacement thickness, momentum thickness and laminar sub-layer of boundary layer	4												
	c)	Explain growth of boundary layer over a flat plate	4												
OR															
Q.6)	a)	Prove that velocity distribution for the steady laminar flow between fixed parallel plates is parabolic	6												
	b)	Explain boundary layer separation and its control	4												
	c)	Calculate displacement thickness and momentum thickness of boundary layer for velocity distribution of $\frac{u}{U} = \left(\frac{y}{\delta}\right)^{1/7}$	4												
Q.7)	a)	Two pipes are connected in parallel. Following are the details of these pipes <table border="1"> <thead> <tr> <th></th><th>Diameter</th><th>Length</th><th>Friction Factor</th></tr> </thead> <tbody> <tr> <td>Pipe A</td><td>0.75m</td><td>1000m</td><td>0.018</td></tr> <tr> <td>Pipe B</td><td>1m</td><td>750m</td><td>0.020</td></tr> </tbody> </table> If total discharge of $1 \text{ m}^3/\text{s}$ is distributed into pipe A and B, determine the discharge in each pipe		Diameter	Length	Friction Factor	Pipe A	0.75m	1000m	0.018	Pipe B	1m	750m	0.020	6
	Diameter	Length	Friction Factor												
Pipe A	0.75m	1000m	0.018												
Pipe B	1m	750m	0.020												
	b)	What is siphon? On what principle does it work? Explain	4												
	c)	Discuss three reservoir problem.	4												
OR															
Q.8)	a)	What are various losses in the pipe? Give the expression for each.	6												
	b)	A compound piping system consists of 1800 m of 50cm, 1200 m of 40 cm and 600 m of 30 cm diameter pipes of the same material connected in series. What is the equivalent length of a 40cm pipe of the same material	4												
	c)	State any four characteristics of turbulent flow	4												