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Paper code – U229-113 (BE-F&FS)

Total No. of Questions – [8] Total No. of Printed Pages : 2

G.R. No.	

Dec 2019/ENDSEM/BACKLOG

S. Y. B. TECH. (Civil-2017 course) (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) Shear stress at a point in oil is 0.25 Pa and the velocity gradient at the point is 0.2 per second. Find the viscosity of the oil. If the density of the oil is 960 kg/m^3 find the kinematic viscosity of the oil 6

OR

b) Derive equation for pressure inside a hollow bubble and surface tension as well as expression for determining relation between pressure inside the droplet of liquid and surface tension. 6

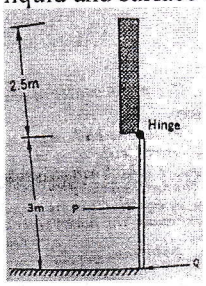
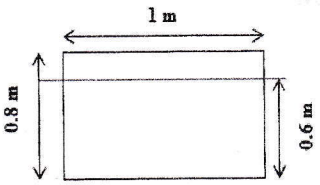
Q.2) a) 

Figure shows a vertical gate 2 m wide and 3 m deep hinged at the top retaining water. Find the horizontal force that should be applied at the bottom of the gate to keep it in equilibrium in the vertical position. 6

OR

b) A uniform rectangular block 2 m long, 1 m wide and 0.8 m deep floats in water, the depth of immersion being 0.6m. Find the position of metacenter. Is the equilibrium stable? 6



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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) Derive equation for discharge passing through a venturimeter 4

OR

b) A pitot tube records a reading of 7.85 kPa as the stagnation pressure when it is held at the centre of a pipe 250 mm in diameter conveying water. The static pressure in the pipe is 40 mm of mercury (vacuum). Calculate the discharge in the pipe 4

Q.5) a) A 1.8 m wide 5 m long plate moves through stationary air of density 1.22 kg/m^3 and viscosity 1.8 $x10^{-5}$ Ns/m^2 at a velocity of 1.75 m/s parallel to its length. Determine drag force on one side of the plate (a) assuming laminar flow condition (ii) turbulent flow condition 6

b) A horizontal pipe 60 mm in diameter conveys oil of specific weight 9200 N/m^3. The pressure difference between two sections 8 m apart is found to be 20000N/m^2. The oil flowing in the pipe is collected in a weighing tank for 4 minutes which weighed to be 7020 N. Find dynamic viscosity of the oil 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 in a circular pipe 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 $\frac{u}{U}=\left(\frac{y}{\partial}\right)^{1/7}$ 4

Q.7) a) Derive Darcy Weisbach equation for flow through pipe 6

b) What is eddy viscosity? How does it differ from dynamic viscosity 4

c) Discuss method of solving pipe network using Hardy Cross method 4

OR

Q.8) a) Derive relationship friction factor f and wall shear stress τ_0 for flow through pipe 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