Reg. No. : | | | | | | | | | | |

Question Paper Code: 53105

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Third Semester

Civil Engineering

01UCE305 – FLUID MECHANICS

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Define viscosity and write the units.
2. Define bulk modulus of elasticity.
3. Illustrate hydrostatic law.
4. Define metacentric height.
5. Define stream tube.
6. Define path line
7. Mention any four discharge measuring devices.
8. Define Bernoulli's equation.
9. What is dimensional homogeneity?
10. Write the advantages of model analysis.

PART - B (5 x 16 = 80 Marks)

11. (a) Calculate the dynamic viscosity of oil, which is used for lubrication between a square plate of size 0.8*m*x0.8*m* and an inclined plane with an angle of inclination 30^0. The weight of the square plate is 300*N* and it slides down on an inclined plane at a velocity of 0.3*m/s*. The thickness of the oil film is 1.5*mm.* (16)

Or

(b) Calculate the capillary rise in a glass tube of 2.5*mm* in diameter when immersed vertically in a water and mercury. The surface tension of water and mercury are 0.0725*N/m* and 0.52*N/m* respectively. The specific gravity of mercury is 13.6 and contact angle is 130^0 and give reason why there is a fall in mercury capillary. (16)

12. (a) A circular plate 1.5*m* diameter is submerged in water with its greatest and least depths below the surface being 2*m* and 0.75*m* respectively. Determine the total pressure and centre of pressure on the plate. (16)

Or

(b) A uniform body of size 3*m* long 2*m* wide 1*m* deep floats in water. What is the weight of the body if the depth of the immersion is 0.8*m*? Determine the meta-centric height also. (16)

13. (a) Derive the continuity equation for three dimensional flows in Cartesian coordinates. (16)

Or

(b) If for a Two dimensional potential flow, the velocity potential is given by $\phi = x(2y-1)$, determine the velocity at P(4, 5) and the stream function at the point P. (16)

14. (a) Derive the discharge equation for venturimeter. (16)

Or

(b) (i) A pipe line carrying oil of specific gravity 0.87, changes in diameter from 200 mm at a position A to 500 mm diameter to a position B which is 4 m at a higher level. If the pressures at A and B are 100 kN/m^2 and 60 kN/m^2 respectively. If the discharge is 0.20 m^3/s, determine the loss of head and direction of flow. (10)

(ii) A jet of water, 75 mm in diameter, issues with a velocity of 30 m/s and impinges on a stationary flat plate. Find the force exerted by the jet on the plate. (6)

15. (a) The efficiency of a fan depends on the densityρ, the dynamic viscosity μ of the fluid, the angular velocity ω, diameter D of the rotor and the discharge Q. Express η in terms of dimensionless parameters. (16)

Or

(b) (i) An oil of specific gravity 0.92 and viscosity 0.03 poise is to be transported at the rate of 2.5 m^3/s through a 1.20 m diameter pipe. Tests were conducted on a 12 cm diameter pipe using water at 20°C. If the viscosity of water at 20°C is 0.01 poise, find the velocity flow in the model and rate of flow in the model. (10)

(ii) Classify the hydraulic models. Discuss the merits and demerits of each model. (6)