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

**Question Paper Code: 33105**

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

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 surface tension.
2. What is the use of control volume?
3. State Pascal's law.
4. Define metacentric height.
5. Define path line.
6. Define stream tube.
7. Mention any four discharge measuring devices.
8. Give any three applications of Bernoulli's equation.
9. What is dimensional homogeneity?
10. What is dimensionally homogeneous equation?

PART - B (5 x 16 = 80 Marks)

11. (a) The space between two square flat parallel plates is filled with oil. Each side of the plate is 720mm. The thickness of the film is 15mm.The upper plate which moves at 3m/s requires a force of 120N to maintain the speed. Determine (i) the dynamic viscosity of the oil. (ii) The kinematic viscosity of oil if the specific gravity of oil is 0.95. (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) Derive Euler's equation of motion along a stream line for an ideal fluid. (16)

15. (a) The efficiency of a fan depends on the density $\rho$, the dynamic viscosity $\mu$ of the fluid, the angular velocity $\omega$, diameter D of the rotor and the discharge Q. Express $\eta$ in terms of dimensionless parameters. (16)

Or

(b) The wave resistance of a ship when travelling at 12.5*m/s* is estimated by test on 1/40 scale model. The resistance measured in fresh water was 16*N*. Determine the speed of the model and the wave resistance of the prototype in sea water. The density of sea water = 1025 $kg/m^3$. (16)

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