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Question Paper Code: 31135

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

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. State Newton's law of viscosity.
2. What is the use of control volume?
3. Mention the three conditions of equilibrium of a floating body.
4. Distinguish between simple and differential manometers.
5. Define stream function.
6. Define the terms steady and unsteady flow.
7. State momentum principle.
8. Give any three applications of Bernoulli's equation.
9. Name the three types of similarities.
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) (i) Calculate the capillary effect in millimeters in a glass tube of 4mm diameter, when immersed in (i) water and (ii) mercury. The temperature of the liquid is 20°C and the values of surface tension of water and mercury at 20°C in contact with air are 0.0735N/m and 0.51N/m respectively. The contact angle for water $\theta = 0^\circ$ and for mercury $\theta = 130^\circ$. Take specific weight of water at 20°C as equal to 9790N/m³. (10)
- (ii) Discuss the various fluid properties. (6)

12. (a) State and prove Pascal's law. (16)

Or

- (b) A rectangular plate 3m long and 1m wide is immersed vertically in water in such a way that its 3m side is parallel to the water surface and is 1m below it. Find (i) total pressure on the plate and (ii) position of center of pressure. (16)

13. (a) Water flows through a pipe AB which is 1.5m diameter at a velocity 2.5m/s and then passes through a pipe BC of 1.8m diameter, at C, the pipe branches. The branch CD of 0.8m diameter and carries 1/3 of flow in AB. The flow velocity in CE is 2m/s. Find the volume rate of flow in AB, velocity in BC, velocity in CD and diameter CE. (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 Euler's equation and obtain Bernoulli's equation from it. Mention clearly the assumptions involved. (16)

Or

- (b) A 300X150mm venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9. The difference in elevation of throat and entrance is 300mm. The manometer shows a deflection of 250mm. Calculate (i) Discharge of oil and (ii) pressure difference between entrance and throat section. Take $C_d = 0.98$ and specific gravity of mercury is 13.6. (16)
15. (a) The efficiency of a fan depends on the density ρ , 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) Explain the different types of similarities that exist between a model and Prototype. (16)
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