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Question Paper Code: 33015

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

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 compressibility.
2. What is Newton's law of viscosity?
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. 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 $0.8m \times 0.8m$ and an inclined plane with an angle of inclination 30° . The weight of the square plate is $300N$ and it slides down on an inclined plane at a velocity of $0.3m/s$. The thickness of the oil film is $1.5mm$. (16)

Or

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

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

Or

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

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

Or

(b) A 30cm diameter pipe, conveying water, branches into two pipes of diameters 20cm and 15cm respectively. If the average velocity in the 30cm diameter pipe is 2.5m/s , find the discharge in this pipe. Also determine the velocity in 15cm pipe, if the average velocity in 20cm diameter pipe is 2m/s . (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 thrust force, F generated by a propeller is found to depend on the following parameters: diameter D , forward velocity u , density ρ , viscosity μ and rotational speed N . Determine the dimensionless parameters to correlate the phenomenon. (16)

Or

(b) The wave resistance of a ship when travelling at 12.5m/s is estimated by test on $1/40$ scale model. The resistance measured in fresh water was 16N . 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)