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B.E (FULL TIME) DEGREE END SEMESTER EXAMINATION, APRIL/MAY 2011

AGRICULTURAL AND IRRIGATION ENGINEERING

III SEMESTER - (REGULATION 2004)

CE 272 - FLUID MECHANICS

Time: 3 hours **Marks: 100**

Part – A **10 x 2 = 20**

Answer ALL questions

1. Define density and weight density.
2. What do you understand by Total Pressure and Centre of Pressure?
3. Define flow net.
4. Define Impulse Momentum Equation.
5. State Buckingham π theorem.
6. What is similarity in model study?
7. Define HGL and TEL.
8. What is Moody Diagram? State its use in pipe flows.
9. Define energy thickness.
10. What is meant by boundary layer separation?

Part - B **5 x 16 = 80**

11. (i) What are the different methods of preventing the separation of boundary layer? **(8)**

    (ii) Find the displacement, momentum and energy thickness for the velocity distribution in the boundary is given by $u/U = 2 (y/\delta) - (y/\delta)^2$ **(8)**

12. (a) (i) Explain with the neat sketch Surface tension and Capillarity and obtain necessary expressions. **(8)**

    (ii) An open tank contains water upto a depth of 2 m and above it an oil of specific gravity 0.9 for a depth of 1 m. find the pressure intensity (i) at the interface of the two liquids, and (ii) at the bottom of the tank. **(8)**

(OR)

(b) A wooden cylinder of specific gravity is 0.6 and circular in cross-section is required to float in oil (specific gravity= 0.9). Find the L/D ratio for the cylinder to float with its longitudinal axis vertical in oil, where L is the height of cylinder and D is its diameter. **(16)**

13. (a) Derive Euler's equation of motion along a stream line and obtain Bernoulli's equation by its integration. State all assumptions made. **(16)**

(OR)

(b) A 45^0 reducing bend, 0.6m diameter upstream, 0.3 m diameter down stream, has water flowing through it at the rate of $0.45 m^3/s$ under a pressure of 1.45 bar. Neglecting any loss is head for friction; calculate the force exerted by the water on the bend, and its direction of application. **(16)**

14. (a) The pressure difference Δp in a pipe of diameter D and length L due to turbulent flow depends on the velocity V, viscosity μ, density ρ, and roughness k. Using Buckingham's π – theorem, obtain an expression for Δp. **(16)**

(OR)

(b) (i) In an aeroplane model of size 1 / 10 of its prototype the pressure drop is 7.5 KN / m^2. The model is tested in water. Find the corresponding pressure drop in the prototype. Take density of air is 1.4 kg / m^3, density of water is 1000 kg / m^3, viscosity of air is 0. 00018 poise and viscosity of water is 0.01poise. **(10)**

(ii) Write short note on the model similitude. **(6)**

15. (a) (i) Derive the Darcy-Weisbach equation for loss of head due to friction in turbulent flow through pipe. **(8)**

(ii) A pipe line 60 cm diameter bifurcates at a Y junction into two branches 40cm and 30cm in diameter. If the rate of flow in the main pipe is 1.5 m^3/s and the mean velocity of flow in 30 cm pipe is 7.5 m/s. determine the rate of flow in the 40 cm diameter pipe. **(8)**

(OR)

(b) Derive from basic principle Hagen Poiseuille equation for laminar flow through pipe line. **(16)**