Roll No. ..... **Total Pages : 03**

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BT-4/M-20

FLUID MECHANICS-II

CE-206N

Time : Three Hours] [Maximum Marks : 75

Note: Attempt *Five* questions in all, selecting at least one question from each Unit. All questions carry equal marks. Assume any missing data.

Unit I

1. (a) What do you understand by Stokes' law ? Derive an equation of Stokes' law used in the fluid mechanics. **7½**

(b) What do you understand by Navier Stokes' flow equations ? Explain its different terms along with assumptions. **7½**

2. (a) Draw a neat sketch of Moddy's diagram used for commercial pipes and explain its salient features. **7½**

(b) For distribution main of city water supply, a 0.30 m main is required. As pipes above 0.25 m diameter are not available, it is decided to lay two parallel mains of same diameter. Find diameter of the parallel main. **7½**

Unit II

3. (a) A cylinder of 0.60 m diameter is rotated at 640 rpm in air stream of velocity 11 m/sec. If it develops a lift on 96 N per meter length of cylinder, determine the ratio of actual to theoretical lift. Take ρ = 1.236 kg/m^3 **7½**

(b) Distinguish between different types of drag. In case of sphere, explain them with reference to Reynold's number. **7½**

4. (a) Water flows at a depth of 2m in a trapezoidal channel having a bottom width 6 m, side slope 2H : 1V. If it has to carry discharge 6 m^3/sec. Calculate bottom slope taking N = 0.025. **7½**

(b) What is a gradually varied flow ? Discuss profiles developed on horizontal and critical slopes with heat diagrams. **7½**

Unit III

5. (a) Determine the sonic velocity of (i) mercury with bulk modulus of 24 GN/m^2 (ii) crude oil of specific gravity 0.91 and bulk modulus 1.56 GN/m^2 **7½**

(b) Define shock waves. Explain about normal shock waves produced in a compressible flow. **7½**

6. (a) Define the following processes :
Isobaric, Isochoric, Isothermal and Isentropic. **7½**

(b) Determine velocity of a bullet fired in the atmosphere at 15º, if the Mach angle is 30º. Take value of gamma = 1.4 and R = 287 J/kg/K. **7½**

Unit IV

7. (a) What is specific speed? How is it helpful in comparing the turbines of different types ? **7½**

(b) A reaction turbine working under a head of 5 m produces 70 kW. The speed of the runner is 180 rpm and discharge 1.5 m^3/sec. If the head increases to 15 m, determine the values of the speed, discharge and power. **7½**

8. (a) What are the main components of a reciprocating pump ? Discuss its working with neat sketch. **7½**

(b) The impeller of a centrifugal pump rotates at 1100 rpm. It generates 21 m of head while delivering 1.3 m^3 of water per second. Find the impeller type being used for such a pump. **7½**