Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Third Semester B. Tech. (Civil Engineering)

Summer Term – 2015

Course Code: CEU302

Course Name: Fluid Mechanics

Time: 2 Hrs. 30 Min. **Max. Marks: 60**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Diagrams/sketches should be given wherever necessary.
4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

1. A Distinguish between ideal fluid and real fluid **2**

B i) A circular jet of water 0.5 mm in diameter issues from an opening. What is the pressure difference between the inside and outside of the jet. The surface tension at the water-air interface is 0.073 N/m.

4

ii)What is bulk modulus of Elasticity?

OR

A circular plate 3.5 m in diameter is submerged in water in such way that the least and greatest depths of plate below free surface of water are

Contd

2.5 m and 4 m respectively. Find the total pressure force on the plate and the position of center of pressure.

C A hot plate of area 0.125 m^2 is pulled at 0.25 m/s with respect to another stationary parallel plate 1 mm distant from it the space between the plates containing water of viscosity 0.001 N-s/m^2, find the force necessary to maintain this velocity and also the power required. 6

2. A Define the terms" center of pressure" and "total pressure" in immersed body. 2

OR

Define i) Stream line and ii) Streak line

B A wooden block (specific gravity 0.8) of dimensions 1 m × 0.5 m ×0.4m floats in water with its shortest axis vertical . Determine the metacentric height and state the condition of its equilibrium. 4

C A pipline carrying water changes in diameter from 20 cm at section 1 to 40 cm diameter at section 2 which is 6m at higher level. If the pressure at section 1 and 2 are 120 kN/ m^2 and 80 kN/ m^2 , respectively and the discharge is 200 liters/sec, determine the head loss and direction of flow. 6

3. A Explain the term "minor losses "in pipe line. 3

OR

Explain briefly causes, effects and remedial measures for water hammer in pipes.

B If stream function for steady flow is given by 4

$\psi = y^2 - x^2$, determine whether the flow is rotational or irrotational. Find the potential function.

C A 45° reducing pipe bend in a horizontal plane has an inlet diameter of 300 mm and outlet diameter of 150 mm. The pressure at the outlet is 20kPa gauge and rate of flow of water through the bend is 0.09 m^3/s. Neglecting friction, determine the magnitude and direction of force required to keep the bend in position. Neglect the weight of water in the bend. 5

4. A What are the various hydraulic coefficients of orifice? 3

OR

Explain briefly Moody's diagram.

B Water flows through a 300 mm × 150 mm venturimeter at the rate of 0.065 m^3/s and the differential gauge is deflected 1.2 m. Specific gravity of the manometric liquid is 1.6. Determine the coefficient of the venturimeter. 4

C Two reservoirs are connected by two pipes in series of lengths 200 m and 300 m and the diameters 20 cm and 30 cm, respectively. The difference of head between the two surfaces is 10 m. The friction factor for the two pipes are 0.02 and 0.015, respectively. Determine the flow rate. 5

5. A Distinguish between streamlined bodies and bluff bodies. 2

OR

What is Hagen_Poiseuille formula?

B An airplane weighing 33200 N is flying at a

Contd..

velocity of 300 km/hr. The plane has wing surface area of 25 m^2. If the coefficient of drag is 0.025,Find the

i) the coefficient of lift,

ii) the drag force and

iii) the power required to drive the plane. The density of air is given as 1.2 kg/m^3. 4

C Water at 15°C flows between two large parallel plates at a distance of 1.6 mm apart. Determine i) the maximum velocity ii) the pressure drop per unit length and iii) the shear stress at the walls of the plate if the average velocity is 0.2 m/s. The viscosity of water at 15°C is given as 0.01 poise. 6