Assignment: 1 FLUIDS AND THEIR PROPERTIES

1. Discuss SI, MKS and CGS units of Dynamic Viscosity and Kinematic Viscosity.

2. If the velocity distribution over a plate is given by

$$u = \frac{5}{6}y - y^2$$

in which u is the velocity in meter per second at a distance y meter above plate, determine the shear stress at $\boldsymbol{y}$ = **0** and $\boldsymbol{y}$ = **0**. **20** m. Take dynamic viscosity of fluid as 8.63 poises.

3. The space between two square flat parallel plates is filled with oil. Each side of the plate is 50 cm. The thickness of the oil film is 10 cm. The upper plate, which moves at 2.5 meter per sec requires a force of 98.1 N to maintain the speed. Determine:

(i) the dynamic viscosity of the oil in poise and

(ii) the kinematic viscosity of the oil in stokes if the specific gravity of the oil is 0.95.

4. The dynamic viscosity of oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.45 m and rotates at 200 r.p.m. Calculate the power lost in the bearing for a sleeve length of 90 mm. The thickness of the oil film is 1.85 mm.

5. A vertical gap 2.1 cm wide of infinite extent contains a fluid of viscosity 2.0 Ns/m^2 and specific gravity 0.9. A metallic plate 1.15 m X 1.15 m X 0.15

m is to be lifted up with a constant velocity of 0.13 m/sec, through the gap. If the plate is in the middle of the gap, find the force required. The weight of the plate is 35 N.

6. A cylinder of 0.55 m3 in volume contains air at 45^0 C and 0.25 N/mm^2 absolute pressure. The air is compressed to 0.25 m^3. Find (i) pressure inside the cylinder assuming isothermal process and (ii) pressure and temperature assuming adiabatic process. Take k = 1.4.

7. What is the bulk modulus of elasticity of a liquid which is compressed in a cylinder from a volume of 0.0124 m^3 at 75 N/cm^2 pressure to a volume of 0.0122 m^3 at 145 N/cm^2 pressure?

8. An oil of viscosity 5 poise used for lubrication between a shaft and sleeve. The diameter of the shaft is 0.45 m and it rotates at 210 rpm. Calculate the power lost in oil for a sleeve length of 105 mm. The thickness of oil film is 1.1 mm.