College of Engineering & Technology

Department: Mechanical Engineering Marks: 15
Lecturer: Dr. Rola Afify Time: 8:30 – 10:00
Course Code: ME362 Date: 13/3/2016

Name: **Model Answer** R.N.:

Answer the following questions:
Question one (10 marks)

A) Define:

Density : mass per unit volume $\rho = \frac{m}{V}$

Dim. $\frac{M}{L^3}$ for water $\rho = 1000\ kg/m^3$

Specific gravity : $SG = \frac{\text{Sp . weight of fluid}}{\text{Sp. Weight of water}}$

$= \frac{W_f}{W_w} = \frac{\rho_f\ g}{\rho_w\ g} = \frac{\rho_f}{\rho_w}$ dimensionless

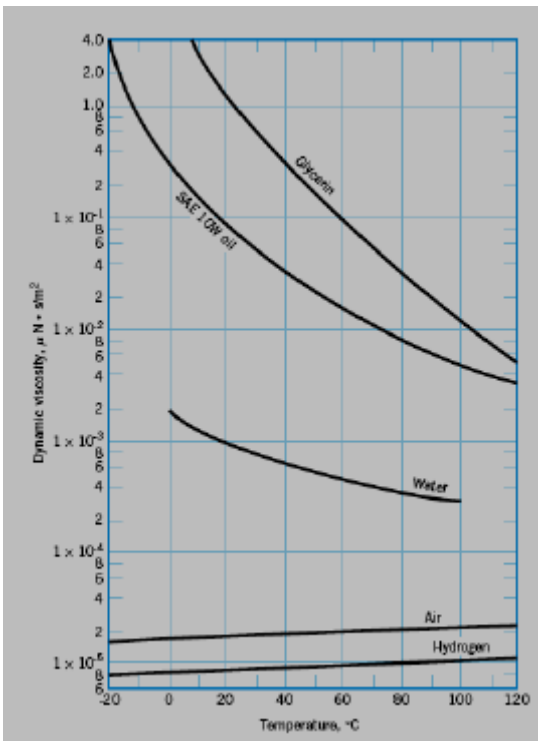
For water $SG_w = 1$

*** Viscosity** (μ): The property which causes friction between fluid and boundary or between fluid layers if they is velocity difference.

B) Show that the equation $P = P_o + \frac{1}{2}\rho v^2 + \rho g z$ satisfies the principle of dimensional homogeneity. where P and P_o are pressures in Pascal, ρ is the density in kg/m^3 and z is the vertical length.

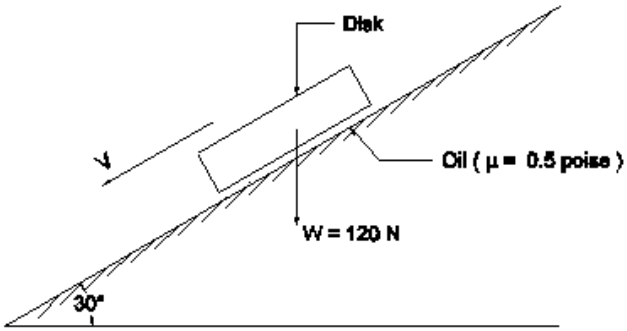
$$\{ML^{-1}T^{-2}\} = \{ML^{-1}T^{-2}\} + \{ML^{-3}\}\{L^2T^{-2}\} + \{ML^{-3}\}\{LT^{-2}\}\{L\}$$
$$= \{ML^{-1}T^{-2}\} \text{ for all terms}$$

C) Sketch the relation between viscosity and temperature for a certain fluid.



Question one (5 marks)

Determine the constant speed with which the disk shown in Figure will move down on the inclined surface if the 0.02-cm gap between the disk and the surface contains oil having viscosity of 0.5 poise. The disk is 50 cm diameter and weighs 120 N.



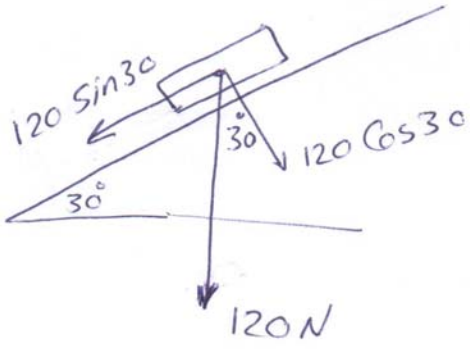
$V = ??$

$y = 0.02 * 10^{-2}\ m$

$\mu = 0.05\ Kg/m.s$

$d = 0.5\ m$

$W = 120\ N$



Soln

$$F = \mu A \frac{du}{dy}$$

$$120 \sin 30 = 0.05 * \frac{\pi}{4}(0.5)^2 * \frac{V}{0.02 * 10^{-2}}$$

$$\therefore V = 1.22\ m/sec.$$