MET 330 Chapter 1 HW

46 $F = 18000$ lb $d = 2.5$ in Find P

$A = \pi \cdot \left(\frac{2.5}{2}\right)^2 = 4.91$ in^2

$P = 18000/4.91 = 3667$ psi

58 $V_2 = 0.99 V_1$ $E_{Hg} = 3590$ ksi $= 24750$ MPa Find ΔP $\Delta V/V = -0.01$

$-0.01 \cdot 3590 = -\Delta P = -35.9$ $\Delta P = 35.9$ ksi

$-0.01 \cdot 24750 = -\Delta P = -247.5$ $\Delta P = 247.5$ MPa

63 $d = 0.5$ in $L = 42$ in $E = 189$ ksi Find stiffness (lb/in)

$A = \pi \cdot 0.25^2 = 0.196$ in^2 $V_1 = 0.196 \cdot 42 = 8.25$ in^3

$V_2 = 0.196 \cdot 41 = 8.05$ in^3 $\Delta V/V = (8.05 - 8.25)/8.25 = -0.0238$

$-\Delta P = 189 \cdot -0.0238 = -4.5$ $\Delta P = 4500$ psi $F = 4500 \cdot 0.196 = 883.6$ lb

Stiffness $= 883.6$ lb/in

76 $W = 1$ lbf Find mass (slugs & kg) and weight (N)

$m = 1/32.17 = 0.031$ slugs $W = 1 \cdot 4.448 = 4.448$ N

$m = 4.448/9.81 = 0.453$ kg

92 $d = 150$ mm $W_{em} = 2.25$ N $W_{fu} = 35.4$ N $L = 200$ mm Find sg

$A = \pi \cdot 0.075^2 = 0.0177$ m^2 $V = 0.0177 \cdot 0.2 = 0.00353$ m^3

$W = 35.4 - 2.25 = 33.15$ N $\gamma = 33.15/0.00353 = 9.38$ kN/m^3

$sg = 9.38/9.81 = 0.956$

107 $sg = 0.79$ Find ρ (slug/ft^3 & g/cm^3)

$\rho = 1.94 \cdot 0.79 = 1.53$ slug/ft^3

$\rho = 1 \cdot 0.79 = 0.79$ g/cm^3

MET 330 Chapter 2 HW

17. Blood plasma, ink, mustard, and toothpaste are all non-Newtonian

18. Viscosity of water at $40^{\circ}C$ is 0.64 mPa

27. Viscosity of hydrogen at $40^{\circ}C$ is 12.4 uPa

35. Viscosity of SAE 30 oil at $210^{\circ}F$ is 0.00025 $lb \cdot s/ft^2$

61. $d = 1.6\ mm \quad Sg_f = 0.94 \quad \gamma_s = 77\ kN/m^3 \quad h = 250\ mm \quad t = 10.4\ s$

Find viscosity. $\gamma_f = 0.94 \cdot 9.81 = 9.22\ kN/m^3 \quad V = 0.25/10.4 = 0.024\ m/s$

$W = F_b + F_d \quad W = \gamma_s \cdot \pi \cdot d^3/6 \quad F_b = \gamma_f \cdot \pi \cdot d^3/6 \quad F_d = 3 \cdot \pi \cdot \eta \cdot v \cdot d$

$$\frac{\gamma_s \cdot \pi \cdot d^3}{6} = \frac{\gamma_f \cdot \pi \cdot d^3}{6} + 3 \cdot \pi \cdot \eta \cdot v \cdot d \rightarrow \eta = \frac{d^2(\gamma_s - \gamma_f)}{18 \cdot v}$$

$\eta = 0.0016^2 \cdot (77 - 9.22)/18 \cdot 0.024 = 0.402\ Pa \cdot s$