CH.1 48, 58, 63, 76, 92, 107 CH.2 17, 18, 27, 35, 61 JORDAN DAVIS

48) GIVEN: F = 18,000 lb DIAMETER: 2.5"
EQs: PRESSURE = FORCE / AREA AREA = $\pi d^2/4$
THEREFORE ⇒ $A = \pi(2.5)^2/4 = 4.9087\ in^2$
⇒ $P = 18{,}000\ lb / 4.9087\ in^2 = \boxed{3666.9\ psi}$

58) GIVEN: $\Delta V/V = .01$ TABLE 1.3 $E = 3{,}590{,}000$ psi
EQs: $E = \frac{-\Delta P}{\Delta V/V}$ 24,750 MPa
⇒ $\Delta P = E(\Delta V/V)$ ⇒ $\Delta P = 3590000(.01) = \boxed{35{,}900\ psi}$
⇒ $\Delta P = 24.750(.01) = \boxed{247.5\ MPa}$

63) GIVEN: DIAMETER = .5" LENGTH = 42" TABLE 1.3 $E = 189{,}000$ psi
EQ: K (STIFFNESS) = EA / L AREA = $\pi d^2/4$
⇒ $A = \pi(.5)^2/4 = .19635\ in^2$
⇒ $K = 189{,}000\ psi(.19635\ in^2)/42" = \boxed{883.58\ lb/in}$

76) GIVEN: 1 lbf HAMBURGER , TABLE K.1
⇒ $\frac{\text{SLUG}}{32.174\ lb} = 1\ lb = \boxed{.031\ \text{SLUGS}}$ ⇒ $\frac{4.448\ N}{1\ lbf}(1\ lbf) = \boxed{4.448\ N}$
⇒ $\frac{kg}{2.205\ lb} = 1\ lb = \boxed{.454\ kg}$

92) GIVEN: .15 m DIAMETER LENGTH (HEIGHT) = .2 m
WEIGHT = 33.15 N $\gamma_{w@4°C} = 9.81\ kN/m^3$
EQs: $\gamma = \text{WEIGHT}/V$ $Sg = \gamma_s/\gamma_{w@4°C}$
⇒ $\gamma_s = 33.15\ N / ((.15m)^2\pi)/4\ (.2m) = 9379.5\ N/m^3$
⇒ $Sg = 9379.5\ N/m^3 / 9810\ N/m^3 = \boxed{.95612}$

JORDAN DAVIS

102) GIVEN: Glycerin $sg = 1.258$, HAVE $50\,gal = V$

EQs: $sg = \gamma_s / \gamma_w @ 4°C$, $\gamma = \text{WEIGHT}/V$

$\Rightarrow \gamma_s = sg(\gamma_w @ 4°C) = 1.258(9810\ N/m^3)$

$\Rightarrow \gamma_s = 12{,}341\ N/m^3$

$\Rightarrow \text{WEIGHT} = \gamma_s(V) = \frac{12341\ N}{m^3}(.189271\ m^3)$

$\Rightarrow$ **2.34 kN** OR **525.1 lbs**

107) GIVEN: Alcohol $sg = .79$, $g = 32.2\ ft/s^2$ or $9.8\ m/s^2$

EQs: $sg = \gamma_s / \gamma_w @ 4°C$, $\gamma = \rho g$, $\gamma_w @ 32°F = 62.4\ lb/ft^3$

$\Rightarrow \gamma_s = .79(9810\ N/m^3) = 7749.9\ N/m^3$

$\Rightarrow \gamma_s = .79(62.4\ lb/ft^3) = 49.296\ lb/ft^3$

$\Rightarrow \rho = \gamma/g = \frac{7749.9\ N}{m^3} \Big| \frac{}{9.8\ m/s^2} = 790.81\ kg/m^3$

$\Rightarrow \rho/1000 = .79081\ g/cm^3$

$\Rightarrow \rho = \gamma/g = \frac{49.296\ lb}{ft^3} \Big| \frac{s^2}{32.2\ ft} = 1.53\ slugs/ft^3$

CH.2 17) NON-NEWTONIAN FLUID EXAMPLES OR FLUIDS THAT DO NOT FOLLOW OR BEHAVE W/ REGULAR RULES OF VISCOSITY.

1) MAYO
2) KETCHUP
3) TOOTHPASTE
4) LATEX OR 2 PART PAINTS

18) WATER @ 40°C → DYNAMIC VISCOSITY (η) = $6.5 \times 10^{-4}\ Ns/m^2$

27) HYDROGEN @ 40°F → DYNAMIC VISCOSITY (η) = $1.8 \times 10^{-7}\ lbs/ft^2$

35) SAE 30 @ 210°F → DYNAMIC VISCOSITY (η) = $2.2 \times 10^{-4}\ lb\text{-}s/ft^2$

JORDAN DAVIS

6.1) GIVEN: STEEL BALL: 1.6mm DIAMETER
HEAVY FUEL OIL: Sg = .94
STEEL BALL WEIGHT = 77 kN/m³
d = 250mm , t = 10.4s , g = 9.8 m/s²
WHAT IS THE VISCOSITY of OIL? η?
EQS: $\eta = \frac{(\gamma_{BALL} - \gamma_{OIL}) D^2}{18 v}$, $\gamma = \rho g$, $\rho = W/g$

$\Rightarrow \eta = \frac{g(\rho_{BALL} - \rho_{OIL}) D^2}{18 v}$ $\quad v = d/t$

$\Rightarrow v = .25m / 10.4s = .024 m/s$

$\rho_{BALL} = (77000 N/m^3) / (9.8 m/s^2)$

$\Rightarrow \rho_{BALL} = 7857.1 kg/m^3$

$\rho_{OIL} = Sg(1000 kg/m^3)$ (ASSUMING 4° C)

$\Rightarrow \rho_{OIL} = 940 kg/m^3$

$\Rightarrow \eta = \frac{(9.8 m/s^2)(7857.1 kg/m^3 - 940 kg/m^3)(.0016 m)^2}{18 (.024) m/s}$

$\Rightarrow \boxed{\eta = .4017 Pa\text{-}S}$