Curtis Domingues HW 1 Jan 20

Chapter 1 48 58 63 76 92 107
Chapter 2 17 18 27 35 61

48) F = 18000 Area = $\pi \cdot \frac{d^2}{4}$ = 4.9

pressure = $\frac{F}{A}$ = $\frac{18{,}000}{4.9}$ = **3666.9**

58) E of mercury = 3,590,000 psi 24750 mpa

$E = \frac{-\Delta P}{\frac{\Delta V}{V}} = \frac{-\Delta P}{.01} = 3{,}590{,}000$

$-\Delta p =$ **35,900 psi**

24750 (.01) = $-\Delta p$

= **247.5 mpa**

63) Dia = .5 in Length = 42 in machine oil

Find: stiffness in lb/in.

Area = .196 in^2

Stiffness is $\frac{E \cdot A}{L}$ $\frac{(189{,}000\ psi)(.196\ in^2)}{42\ in}$

Stiffness = 883.57 lb/in

76) Given: convert 1 lb to slug, to kg, to N

Solution: **1 lb = 4.4482 N**
1 lb = .45359237 kg

1 slug = 14.5938 kg

$\frac{.45359237}{14.5938}$ = **.03108117 slug = 1 lb**

97) 150mm in dia weighs 2.25 N

Depth = 200 mm weight 2 = 35.4 N

Find spec. gravity of oil

$$SG = \frac{\gamma_s}{\gamma_{w@4°C}} = \frac{\rho_s}{\rho_{w@4°C}} \qquad \text{Density} = \frac{m}{V}$$

$$\text{Specific weight} = \frac{W}{V}$$

weight of oil = 35.4 − 2.25 = 33.15 N

volume = $\pi r^2 h = \pi .075^2 (.2) = .0035\ m^3$

$$\text{specific weight} = \frac{33.15}{.00353} = 9{,}390.9\ N/m^3 = 9.39\ kN/m^3$$

$$\text{Specific gravity} = \frac{9.39\ kN/m^3}{9.810\ kN/m^3} = \boxed{.957}$$

107) Alcohal Sg = .79

Find density in slug/ft³ g/cm³

$$.79 = \frac{\gamma_s}{1000\ kg/m^3} \qquad 790\ kg/m^3 = \gamma_s$$

790 kg/m³

1 m³ = 35.315 ft³

1 slug = 14.59 kg

$$790\ \frac{kg}{m^3} \times \frac{1000g}{1kg} \times \frac{1m^3}{1000000cm^3} = \boxed{.79\ g/cm^3}$$

$$790\ \frac{kg}{m^3} \times \frac{1m^3}{35.315ft^3} \times \frac{1slug}{14.59kg} = \boxed{1.53\ slug/ft^3}$$

Chapter 2 17, 18, 27, 35, 61

17) 4 examples of Non-Newtonian fluids
1 Toothpaste
2 Ketchup
3 Mustard
4 Honey

18) at 40°C water's dynatic viscosity = 6.2×10^{-4} Pa·s

27) Hydrogen 1.8×10^{-7} lb-s/ft^2 @ 40°F

35) Find dynamic viscosity @ 210°F of SAE 30 oil

2.3×10^{-4} lb-s/ft^2

61) .0016 mm Dia steel ball which weighs 77KN/m^3

Sg of oil = .94
γ_{oil} = 940 kg/m^3

Ball falls 250 mm in 10.4 s
$V = \frac{.25}{10.4} = .024$ m/s

$F = \mu A V (1/h)$

$h = .25$m $\quad \frac{1}{.25} = 4$

$\frac{F}{A(.024)(4)} = \mu$

volume of a sphere $= \frac{4}{3}\pi r^3$

Specific weight $= \frac{W}{V} = \frac{77000\ N}{.00000000814\ m^3} = 1.65 \times 10^{-7}$

$= \frac{4}{3}\pi .0008^3$

Volume = 2.14×10^{-9} m^3

$\frac{77000\ kN}{1\ m^3} \times$ spec weight