

Problem 48)

$$P = \frac{F}{A} = \frac{18,000 \text{ lb}}{(0.25 \pi \cdot 2.5 \text{ in}^2)} = \boxed{3666.93 \text{ psi}}$$

Problem 58)

$$\Delta P = 0.01 (E_H) = 0.01 \cdot 3590000 \text{ psi} = \boxed{35900 \text{ psi}} = \boxed{247.5 \text{ MPa}}$$

Problem 63)

$$E = \frac{\Delta P}{\frac{\Delta V}{V}} \quad \frac{E}{V} = \frac{\Delta P}{\Delta V} \quad \frac{189000 \frac{\text{lb}}{\text{in}^2}}{42 \pi (0.25 \pi \cdot 0.5 \text{ in}^2)} = \frac{\Delta P}{\Delta V}$$

$$22918.31 \frac{\text{lb}}{\text{in}^3} = \frac{\Delta P}{\Delta V} \quad \frac{\Delta P}{\Delta V} = \frac{F/A}{L/A} = \frac{F}{LA^2}$$

$$\therefore \frac{F}{L} = 22918.31 \frac{\text{lb}}{\text{in}^3} (0.25 \pi \cdot 0.5 \text{ in}^2)^2 = \boxed{883.57 \frac{\text{lb}}{\text{in}}}$$

Problem 7C)

$$\frac{1 \text{ lbf}}{32.2 \frac{\text{ft}}{\text{s}^2}} = \boxed{0.031 \text{ slug}} \quad 0.031 \text{ slug} \left(\frac{14.5939 \text{ kg}}{1 \text{ slug}} \right) = 0.452 \text{ kg}$$

$$0.452 \text{ kg} (9.81 \frac{\text{m}}{\text{s}^2}) = \boxed{4.44 \text{ N}}$$

Problem 92)

$$\rho = \frac{m}{V} \quad m = \frac{\Delta W}{g} = \frac{35.4 \text{ N} - 2.25 \text{ N}}{9.81 \text{ m/s}^2} = 3.379 \text{ kg}$$

$$V = hA = 0.2 \text{ m} (0.25 \pi \cdot 0.15 \text{ m}^2) = 0.00353 \text{ m}^3$$

$$\rho = 956.06 \frac{\text{kg}}{\text{m}^3} \left(\frac{1000 \frac{\text{g}}{\text{kg}}}{1000000 \frac{\text{ml}}{\text{m}^3}} \right) = 0.956 \text{ g/ml}$$

$$\text{S.G.} = \frac{\rho_F}{\rho_{\text{water}}} = \frac{0.956}{0.9998} = \boxed{0.956}$$

Problem 107)

$$S.G. = \frac{\rho_{AL}}{\rho_{H_2O}} \quad \rho_{AL} = 0.79 \cdot 1.94 \frac{\text{slug}}{\text{ft}^3} = \boxed{1.53 \frac{\text{slug}}{\text{ft}^3}}$$

$$\rho_{AL} = 0.79 \cdot 1000 \frac{\text{kg}}{\text{m}^3} \left(\frac{1000 \frac{\text{g}}{\text{kg}}}{100^3 \frac{\text{cm}^3}{\text{m}^3}} \right) = \boxed{0.79 \frac{\text{g}}{\text{cm}^3}}$$

Fluids

Homeworks 1

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Problem 17) Toothpaste, Mayo, Ink, Ketchup

Problem 18) $\eta_{\text{Honey}} \approx 6.1 \cdot 10^{-4} \text{ Pa}\cdot\text{s}$

Problem 27) $\eta_{\text{Honey}} = \eta_{\text{Honey}} \approx 1 \cdot 10^{-6} \text{ Pa}\cdot\text{s}$

Problem 35) $\eta_{\text{Sage Oil}} \approx 1 \cdot 10^{-2} \text{ Pa}\cdot\text{s}$

Problem 61)

$$\eta = \frac{(\gamma_{\text{Ball}} - \gamma_{\text{Fluid}}) D^2}{18v} \quad \gamma_{\text{Ball}} = \frac{W}{V} = 77 \frac{\text{N}}{\text{m}^3}$$

$$\gamma_{\text{Fluid}} = (\text{s.g.}) \gamma_{\text{H}_2\text{O}} = 0.94 \cdot 9.807 \frac{\text{N}}{\text{m}^3} = 9.218 \frac{\text{N}}{\text{m}^3}$$

$$v = \frac{0.25 \text{ m}}{10.4 \text{ s}} = 0.024 \text{ m/s}$$

$$\eta = \frac{(77 \frac{\text{N}}{\text{m}^3} - 9.218 \frac{\text{N}}{\text{m}^3}) \cdot 0.0016 \text{ m}^2}{18(0.024 \text{ m/s})} = \boxed{4.01 \cdot 10^{-4} \frac{\text{Ns}}{\text{m}^2}}$$