2.7) Problem Statement:

What are SG, γ, and ρ for mercury? State your answers in SI units and traditional units.

SKETCH: N/A

KNOWN:

SG = Specific Gravity

γ = specific weight

ρ = density

UNKNOWN:

SG, γ, ρ

SOLUTION:

From Table A.4

SI units:

SG = 13.55

$\gamma = 133{,}000\ N/m^3$

$\rho = 13{,}550\ kg/m^3$

Traditional units:

SG = 13.55

$$\rho = 13{,}550\ kg/m^3 * \frac{1.94\ slug/ft^3}{1000\ kg/m^3} = 26.3\ slug/ft^3$$

$$\gamma = 133{,}000\ N/m^3 * \frac{0.2248\ lbf}{1N} * \frac{1m^3}{35.3ft^3} = 846.98\ lbf/ft^3$$

2.13) Problem Statement:

Calculate the pressure increase that must be applied to water to reduce its volume by 2%.

Uknown:

ΔP

Known:

$\Delta\forall$: ↓ by 2%

Sketch: N/A

Governing Eqns.

$$E = -\Delta P \frac{\forall}{\Delta\forall}$$

SOLUTION:

$$\Delta P = -E \frac{\Delta\forall}{\forall}$$

$E = 2.2 \times 10^9$ Pa from Table A.5

$$\Delta P = -2.2\times10^9 \text{ Pa} \frac{(-0.02\cancel{\forall})}{\cancel{\forall}}$$

$$= 2.2\times10^9 \text{ Pa} (0.02) = 4.4\times10^7 \text{ Pa}$$

$$\boxed{\Delta P = 44 \text{ MPa}}$$

2.35) Problem Statement:

Sliding plate viscometer is used to measure fluid viscosity.

KNOWN:

$A = 50 \times 100\,mm$

$\Delta y = 1\,mm$

$u = 10\,m/s$

$F = 3\,N$

UNKNOWN:

Viscosity of the Fluid.

Governing Eqns.

$$\tau = \frac{Force}{Area}$$

$$\mu = \frac{\tau}{\left(\frac{du}{dy}\right)}$$

SOLUTION:

$$\tau = \frac{3N}{50\,mm \times 100\,mm} = 600\,N/m^2$$

Finding viscosity:

$$\mu = \tau / \left(\frac{du}{dy}\right) = \frac{600\,N/m^2}{[10\,m/s]/[1\,mm]} \times \frac{1}{1000\,mm}$$

$$\boxed{\mu = 6 \times 10^{-2}\,\frac{N \cdot s}{m^2}}$$