

HWK 1

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Chp. 1

(48) $F = 18,000 \text{ lb}$ $D = 2.5 \text{ in}$

$$P = \frac{F}{A}$$

$$A = \frac{\pi}{4} D^2 = \frac{\pi}{4} (2.5)^2 =$$

$$A = 4.909 \text{ in}^2$$

$$P = \frac{18000}{4.909} = \boxed{3666.73 \text{ psi}}$$

(58) BULK MODULUS $E = \frac{-\Delta p}{\Delta V/V}$

MERCURY BULK MODULUS

ATM 68°F OR 20°C

3,590,000 psi

$$3,590,000 \times 0.01$$

$$= \boxed{35,900 \text{ psi}}$$

(63) $\frac{F}{\Delta L}$

$$E = \frac{-P}{\Delta V/V}$$

$$P = \frac{F}{A}$$

$$V = A \cdot L$$

$$\frac{EA}{L} =$$

$$\frac{189,000 (0.1963)}{42}$$

$$A = \frac{\pi}{4} D^2 =$$

$$\frac{\pi}{4} 0.5^2 = 0.1963 \text{ in}^2$$

$$\text{STIFFNESS} = \boxed{883.35 \text{ lb/in}}$$

MACHINING OIL = 189,000 psi

$$L = 42 \text{ in}$$

$$\textcircled{76} \quad m = \frac{W}{g} \quad g = 32.2 \text{ ft/s}^2 \quad m = \frac{1}{32.2} = 0.31 \text{ lbf} \cdot \text{s}^2/\text{ft}$$

a)

$$m = 0.31 \text{ SLUGS}$$

$$1 \text{ lbf} = 4.448 \text{ N}$$

$$m = \frac{4.448}{9.81} = 0.453 \text{ N} \cdot \text{s}^2/\text{m}$$

b)

$$m = 0.453 \text{ kg}$$

c)

$$W = 4.448 \text{ N}$$

$$\textcircled{92} \quad D = 150 \text{ mm} = 0.15 \text{ m} \quad r = 0.075 \text{ m} \quad \text{CONT. EMPTY} = 2.25 \text{ N}$$

$$V = \pi r^2 h$$

$$\pi (0.075)^2 (0.2)$$

$$\text{DEPTH OF OIL} = 200 \text{ mm} = 0.2 \text{ m}$$

$$W_c = 35.4 \text{ N}$$

$$V = 0.003534 \text{ m}^3$$

$$35.4 - 2.25 = 33.15 \text{ N}$$

$$S_{W_{OIL}} = \frac{W_{OIL}}{V} = \frac{33.15}{0.003534} = 9380.31 \text{ N/m}^3$$

$$= 9.38 \text{ kN/m}^3$$

$$= 0.03315 \text{ kN}$$

$$S_g = \frac{\gamma_{OIL}}{\gamma_{WATER @ 4^\circ C}}$$

$$@ 4^\circ C = 9.81 \text{ kN/m}^3$$

$$S_g = \frac{9.38}{9.81} = 0.956$$

(107) $sg = 1.258$ $V = 50 \text{ gal}$ $\text{WATER} = 62.4 \text{ lb/ft}^3$

$$\gamma_s = sg \cdot 62.4 \text{ lb/ft}^3$$

$$= 1.258 (62.4)$$

$$1 \text{ gal} = 0.13367 \text{ ft}^3$$

$$= 78.4992 \text{ lb/ft}^3$$

$$W = 78.4992 (50) (0.13367)$$

$$W = 524.65 \text{ lbs}$$

Chp 2

(17) BINGHAM FLUID

DILATANT FLUIDS

THIXOTROPIC FLUIDS

RHEOPECTIC FLUIDS

(18) WATER @ 40°C = $6.5 \times 10^{-4} \text{ Pa}\cdot\text{s}$

(27) HYDROGEN @ 40°F = $1.8 \times 10^{-7} \text{ lb}\cdot\text{s/ft}^2$

(35) SAE 30 OIL @ 210°F = $2.1 \times 10^{-4} \text{ lb}\cdot\text{s/ft}^2$

$$(61) D = 1.6 \text{ mm} = 0.0016 \text{ m}$$

$$S_{g_{oil}} = 0.94$$

$$\gamma_{SB} = 77 \text{ kN/m}^3$$

$$L = 250 \text{ mm} \quad T = 10.45$$

$$\eta = \frac{F_d}{3\pi \eta D V}$$

$$S_g = \frac{S_{W_{oil}}}{S_{W_{water}}}$$

$$0.94 = \frac{\gamma_F}{9.81 \text{ kN/m}^3}$$

$$\gamma_F = (0.94)(9.81)$$

$$\gamma_F = 9.2214 \text{ kN/m}^3$$

$$F_b = 9.22 \left(\frac{\pi D^3}{6} \right) V$$

$$9.22 \left(\frac{\pi (1.6 \times 10^{-3})^3}{6} \right)$$

$$9.22 (2.14 \times 10^{-9})$$

$$F_b = 1.97 \times 10^{-8} \text{ kN}$$

$$V = \frac{L}{T} = \frac{0.25 \text{ m}}{10.45} = 0.024 \text{ m/s}$$

$$W = \gamma_{SB} V$$

$$= (77 \text{ kN/m}^3)(2.14 \times 10^{-9})$$

$$= 1.6478 \times 10^{-7} \text{ kN}$$

$$W = 1.65 \times 10^{-7} \text{ kN}$$

$$W - F_b - F_d = 0$$

$$(1.65 \times 10^{-7} \text{ kN}) - (1.97 \times 10^{-8} \text{ kN}) - F_d = 0$$

$$1.453 \times 10^{-7} - F_d = 0$$

$$F_d = 1.453 \times 10^{-7} \text{ kN}$$

$$\eta = \frac{1.453 \times 10^{-7} \text{ kN}}{3\pi (0.024 \text{ m/s})(1.6 \times 10^{-3} \text{ m})}$$

$$= 4.0147 \times 10^{-4} \text{ kN} \cdot \text{s/m}^2$$

$$0.40147 \text{ N} \cdot \text{s/m}^2$$

$$\boxed{\eta = 0.4015 \text{ Pa} \cdot \text{s}}$$