

HW 6

$$7-3. 1100 I_1 + 1000 I_2 = 9$$

$$1100 I_2 + 1000 I_1 = 0$$

$$a. I_2 = -\frac{1000}{1100} (I_1)$$

$$1100 I_1 + 1000 \left(-\frac{1000}{1100} I_1 \right) = 9$$

$$1100 I_1 - \frac{1000000}{1100} I_1 = 9$$

$$190.9 I_1 = 9$$

$$I_1 = .047$$

$$\therefore I_2 = -\frac{1000}{1100} (.047) = -.043$$

$$b. AI = b$$

$$\begin{bmatrix} 1100 & 1000 \\ 1000 & 1100 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} 9 \\ 0 \end{bmatrix}$$

$$c. A^{-1} = \frac{1}{1100(1100) - 1000(1000)} \begin{bmatrix} 1100 & -1000 \\ -1000 & 1100 \end{bmatrix} = \frac{1}{210000} \begin{bmatrix} 1100 & -1000 \\ -1000 & 1100 \end{bmatrix}$$

$$A^{-1}b = \frac{1}{210000} \begin{bmatrix} 1100 & -1000 \\ -1000 & 1100 \end{bmatrix} \begin{bmatrix} 9 \\ 0 \end{bmatrix} = \frac{1}{210000} \begin{bmatrix} 1100(9) - 1000(0) \\ -1000(9) + 1100(0) \end{bmatrix} = \begin{bmatrix} .047 \\ -.043 \end{bmatrix}$$

$$d. \frac{|A_1|}{|A|} = \frac{\begin{vmatrix} 9 & 1000 \\ 0 & 1100 \end{vmatrix}}{\begin{vmatrix} 1100 & 1000 \\ 1000 & 1100 \end{vmatrix}} = \frac{9(1100) - 0(1000)}{210000} = .047$$

$$x_1 = \frac{|A_1|}{|A|} = \frac{210000}{210000} = .047$$

$$x_2 = \frac{|A_2|}{|A|} = \frac{\begin{vmatrix} 1100 & 9 \\ 1000 & 0 \end{vmatrix}}{210000} = \frac{0(1100) - 9(1000)}{210000} = -.043$$

$$7-12. .866 F_1 - F_2 = 0$$

$$.5 F_1 = 750$$

$$a. AF = b$$

$$\begin{bmatrix} .866 & -1 \\ .5 & 0 \end{bmatrix} \begin{bmatrix} F_1 \\ F_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 750 \end{bmatrix}$$

$$b. A^{-1}b = F$$

$$A^{-1} = \frac{1}{.866(.5) + (1)(0)} \begin{bmatrix} 0 & .5 \\ 1 & .866 \end{bmatrix} = \frac{1}{.433} \begin{bmatrix} 0 & .5 \\ 1 & .866 \end{bmatrix}$$

$$F = \frac{1}{.433} \begin{bmatrix} 0 & .5 \\ 1 & .866 \end{bmatrix} \begin{bmatrix} 0 \\ 750 \end{bmatrix} = \frac{1}{.433} \begin{bmatrix} 0(.5) + .5(750) \\ 1(.5) + .866(750) \end{bmatrix} = \begin{bmatrix} -866.05 \\ 1500 \end{bmatrix}$$

$$c. x_1 = \frac{\begin{vmatrix} 0 & -1 \\ 750 & 0 \end{vmatrix}}{.433} = \frac{0(0) - 750(-1)}{.433} = 1732.1$$

$$x_2 = \frac{\begin{vmatrix} .866 & 750 \\ .5 & 0 \end{vmatrix}}{.433} = \frac{.866(750) - .5(0)}{.433} = 1500 \checkmark$$

$$7-16. R_1 + R_2 = 4800$$

$$6R_1 - 4R_2 = 0$$

$$a. R_1 = \frac{2}{3}R_2$$

$$(\frac{2}{3}R_2) + R_2 = 4800$$

$$\frac{5}{3}R_2 = 4800$$

$$R_2 = 2880$$

$$\therefore R_1 = \frac{2}{3}(2880) = 1920$$

$$b. AR = b$$

$$\begin{bmatrix} 1 & 1 \\ 6 & -4 \end{bmatrix} \begin{bmatrix} R_1 \\ R_2 \end{bmatrix} = \begin{bmatrix} 4800 \\ 0 \end{bmatrix}$$

$$c. A^{-1}b = R$$

$$A^{-1} = \frac{1}{1(-4) - 1(6)} \begin{bmatrix} -4 & -1 \\ -6 & 1 \end{bmatrix} = \frac{1}{-10} \begin{bmatrix} -4 & -1 \\ -6 & 1 \end{bmatrix}$$

$$R = \frac{1}{-10} \begin{bmatrix} -4 & -1 \\ -6 & 1 \end{bmatrix} \begin{bmatrix} 4800 \\ 0 \end{bmatrix} = \frac{1}{-10} \begin{bmatrix} -4(4800) \\ -6(4800) \end{bmatrix} = \begin{bmatrix} 1920 \\ 2880 \end{bmatrix}$$

$$d.$$

$$x_1 = \frac{\begin{bmatrix} 4800 & -1 \\ 0 & -4 \end{bmatrix}}{-10} = \frac{4800(-4) - 1(0)}{-10} = 1920$$

$$x_2 = \frac{\begin{bmatrix} 1 & 4800 \\ 6 & 0 \end{bmatrix}}{-10} = \frac{1(0) - 6(4800)}{-10} = 2880$$

$$7-21. .866F + .05N = -30$$

$$.5F + .866N = 100$$

$$a. Ax = b$$

$$\begin{bmatrix} .866 & .05 \\ .5 & .866 \end{bmatrix} \begin{bmatrix} F \\ N \end{bmatrix} = \begin{bmatrix} -30 \\ 100 \end{bmatrix}$$

$$b. A^{-1} = \frac{1}{.866(.866) + .5(.05)} \begin{bmatrix} .866 & .05 \\ -.5 & .866 \end{bmatrix} = \frac{1}{.999956} \begin{bmatrix} .866 & .05 \\ -.5 & .866 \end{bmatrix}$$

$$x = \frac{1}{.999956} \begin{bmatrix} .866 & .05 \\ -.5 & .866 \end{bmatrix} \begin{bmatrix} -30 \\ 100 \end{bmatrix} = \frac{1}{.999956} \begin{bmatrix} .866(-30) + .05(100) \\ -.5(-30) + .866(100) \end{bmatrix} = \begin{bmatrix} 24.02 \\ 71.6 \end{bmatrix}$$

$$c. \begin{bmatrix} -30 & .05 \\ 100 & .866 \end{bmatrix} = \frac{-30(.866) + .05(100)}{.999956} = 24.02$$

$$x_1 = \frac{.999956}{.999956} = 24.02$$

$$x_2 = \frac{\begin{bmatrix} .866 & -30 \\ .5 & 100 \end{bmatrix}}{.999956} = \frac{.866(100) + .5(30)}{.999956} = 71.6$$

$$7-39. 2.57u + 3.33v = -.05$$

$$3.33u + 6.99v = 0 \quad \downarrow$$

$$a. u = \frac{-6.99}{3.33} v$$

$$2.57\left(\frac{-6.99}{3.33} v\right) + 3.33v = -.05$$

$$-2.06v = -.05$$

$$v = .024$$

$$u = \left(\frac{-6.99}{3.33}(.024)\right) = -.051$$

$$b. Ax = b$$

$$\begin{bmatrix} 2.57 & 3.33 \\ 3.33 & 6.99 \end{bmatrix} \begin{bmatrix} u \\ v \end{bmatrix} = \begin{bmatrix} -.05 \\ 0 \end{bmatrix}$$

$$c.$$

$$A^{-1} = \frac{1}{2.57(6.99) - 3.33(3.33)} \begin{bmatrix} 6.99 & -3.33 \\ -3.33 & 2.57 \end{bmatrix} = \frac{1}{6.88} \begin{bmatrix} 6.99 & -3.33 \\ -3.33 & 2.57 \end{bmatrix}$$

$$x = \frac{1}{6.88} \begin{bmatrix} 6.99 & -3.33 \\ -3.33 & 2.57 \end{bmatrix} \begin{bmatrix} -.05 \\ 0 \end{bmatrix} = \frac{1}{6.88} \begin{bmatrix} 6.99(-.05) \\ -3.33(-.05) \end{bmatrix} = \begin{bmatrix} -.051 \\ .024 \end{bmatrix}$$

$$d.$$

$$u = \frac{\begin{bmatrix} -.05 & 3.33 \\ 0 & 6.99 \end{bmatrix}}{6.88} = \frac{6.99(-.05)}{6.88} = -.051$$

$$v = \frac{\begin{bmatrix} 2.57 & -.05 \\ 3.33 & 0 \end{bmatrix}}{6.88} = \frac{2.57(-.05)}{6.88} = .024$$