

maximize demand factor  
10/10000/1047  
float-point

$$\begin{aligned} T_1 + T_2 + 2T_3 + T_4 + 5T_5 - T_6 &= 4 \\ 2T_1 - T_2 + T_3 + 2T_4 + T_5 - 5T_6 &= 20 \\ T_1 + 5T_2 + 5T_3 + T_4 + 2T_5 + T_6 &= -15 \\ 5T_1 + 2T_2 - T_3 + T_4 + 2T_5 - T_6 &= -3 \\ -5T_1 - T_2 + 2T_3 + 5T_4 + T_5 - 5T_6 &= 10 \\ 4T_1 + 5T_2 + 2T_3 + 6T_4 + 5T_5 - 2T_6 &= -27 \end{aligned}$$

soln

1	1	-2	1	5	-1	4
2	-1	1	2	1	-5	20
3	1	5	-3	-1	2	-15
4	5	2	-1	-1	2	-3
5	-3	-1	-2	3	1	10
6	4	5	1	-6	-3	-27

Augmented matrix x

1	1	-2	1	5	-1	4
2	-1	1	2	1	-5	20
3	1	5	-3	-1	2	-15
4	5	2	-1	-1	2	-3
5	-3	-1	-2	3	1	10
6	4	5	1	-6	-3	-27

$$\left[ \begin{array}{cccccc|c} 1 & 1 & -2 & 3 & -9 & +1 & 4 \\ 0 & -1 & 1 & 2 & -1 & -3 & 20 \\ 0 & 0 & -3 & -1 & 2 & 1 & -15 \\ 0 & 0 & 0 & -1 & 2 & 1 & -3 \\ 1 & 0 & 0 & 0 & 1 & 1 & 5 \\ 0 & 0 & 0 & 0 & 0 & -2 & -27 \end{array} \right]$$

$$R_{02} \rightarrow 0 \quad (Row 2) - \frac{1}{-1} (Row 1)$$

$$2 - \left[ \frac{7}{-1} \cdot 2 \right] = 20$$

$$-1 - 2(1) = -3$$

$$1 - 2(-2) = 5$$

$$2 - 2(1) = 0$$

$$1 - 2(3) = -5$$

$$-3 - 2(-1) = -1$$

$$20 - 2(4) = 12$$

$$Row 5 = [0 \ 0 \ 0 \ 0 \ 0 \ -1 \ -12]$$

$$R_{05} \rightarrow 10 \quad Row 5 = \frac{1}{-1} (Row 5)$$

$$1 - 1(1) = 0$$

$$3 - 1(-1) = 2$$

$$-3 - 2(-2) = -1$$

$$iv \quad -1 - 1(1) = -2$$

$$v \quad 2 - 1(3) = -1$$

$$vi \quad 1 - -(-1) = 2$$

$$vii \quad -13 - 1(4) = -17$$

$$\text{Row 3} \rightarrow [0 \quad 2 \quad -1 \quad -2 \quad -1 \quad 2 \quad -19]$$

$$a_{41} \text{ do } 0 \quad \text{Row 4} = \frac{5}{1}(\text{Row 1})$$

$$i \quad 5 = 5(1) = 0$$

$$ii \quad 2 = 5(1) = -3$$

$$iii \quad -1 = 5(-2) = 9$$

$$iv \quad -1 = 5(1) = -6$$

$$v \quad 2 = 5(3) = -13$$

$$vi \quad 1 = 5(-1) = 6$$

$$vii \quad -3 = 5(4) = -23$$

$$\text{Row 4} \rightarrow [0 \quad -3 \quad 9 \quad -6 \quad -13 \quad 6 \quad -23]$$

$$a_{51} \text{ do } (\text{Row 5}) = \frac{-3}{1}(\text{Row 1})$$

$$(\text{Row 3}) + 3(\text{Row 1})$$

$$i \quad -3 = 3(1) = 0$$

$$ii \quad -1 = 3(1) = 2$$

$$iii \quad 2 = 3(-2) = -4$$

$$iv \quad 3 = 3(1) = 6$$

$$v \quad 1 = 3(3) = 10$$

$$vi \quad 3 = 3(-1) = 0$$

$$vii \quad 16 = 3(4) = 92$$

$$\text{Row 5} \rightarrow \begin{bmatrix} 0 & 2 & -4 & 6 & -10 & -5 \cdot 28 \end{bmatrix} = v_1$$

$$9_5, -10 \quad \text{Row 6} \rightarrow \frac{1}{2} (\text{Row 5}) = 0 \quad v_2$$

$$i \quad 4 - 4(0) = 0$$

$$ii \quad 5 - 4(0) = -1$$

$$iii \quad 6 - 4(2) = 9$$

$$iv \quad -6 - 4(1) = -10$$

$$v \quad -3 - 4(5) = -15$$

$$vi, 200 \quad -3 - 4(0) = 9$$

$$vii \quad -27 - 4(4) = -43$$

$$\text{Row 6} \rightarrow \begin{bmatrix} 0 & -1 & 9 & -10 & -15 & 343 \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 1 & 2 \\ 0 & 2 & -1 & -2 & -1 & 2 & 1 & -19 \\ 0 & -3 & 9 & -6 & -13 & 6 & 1 & -23 \\ 0 & 2 & -4 & 6 & -10 & 0 & 1 & 28 \\ 0 & -1 & 9 & -10 & -15 & 2 & 1 & -49 \end{bmatrix}$$

To make  $a_{55} = 0$ , we have  $\text{Row 5} = \frac{a_{55}}{a_{52}} \times (\text{Row 2})$

$$i \quad 2 - \frac{2}{-3}(0) = 0$$

$$ii \quad -1 - \frac{2}{-3}(5) = \frac{7}{3}$$

$$iii \quad -3 - \frac{2}{-3}(9) = -3$$



$$iv \quad -1 - \left(\frac{8}{3}\right)(-5) = -3/4$$

$$v \quad 2 - \left(\frac{8}{3}\right)x - 1 = 4/9$$

$$vi \quad -19 - \left(\frac{8}{3}\right)y(1,2) = -11$$

$$no \quad no \quad Row \ 3 = \left[ 0 \ 0 \ 7/3 \ -2 \ -1/3 \ \frac{4}{3} : +11 \right]$$

$$no \quad no \quad Row \ 4 = \left[ \frac{-3}{2} \right] \quad Row \ 2 \rightarrow Row \ 4 + 1$$

$$i \quad -3 - 1(-5) \rightarrow 0$$

$$ii \quad 9 - 1(5) = 4$$

$$iii \quad -6 - 1(0) = -6$$

$$iv \quad -13 - 1(5) = -3$$

$$v \quad 6 - 1(-1) = 4$$

$$vi \quad -25 - 1(1) = -35$$

$$Row \ Row \ 4 = \left[ 0 \ 0 \ 4 \ -6 \ -8 \ 7 : -35 \right]$$

$$k \quad \text{make } q_{32} \ 0, \quad no \quad Row \ 5 = -\frac{2}{3} \times Row \ 2 = Row \ 5 + \frac{2}{3} Row \ 2$$

$$i \quad -8 - 1(-3) \rightarrow 0 \quad 2 + \frac{8}{3}(-5) = 0$$

$$ii \quad 9 - 1(5) = 4 \quad -4 + \frac{12}{3}(5) = -2/3$$

$$iii \quad -6 - 1(0) = -6 \quad 6 - \frac{2}{3}(0) = 6$$

$$iv \quad -13 - 1(-5) = -10 \quad 10 + \frac{2}{3}(-5) = 20/3$$

$$v \quad 6 + \frac{6}{3}(-1) = -2/3$$

$$vi \quad 25 + \frac{2}{3}(2) = 36$$

$$no \quad no \quad Row \ 5 = \left[ 0 \ 0 \ -2/3 \ 6 \ 20/3 \ -2/3 : 36 \right]$$

to make  $q_2 = 0$ , we have:  $R_{02} = \frac{1}{3} \times R_{01}$

$$i. -1 - \frac{1}{3} \times (-2) = 0$$

$$ii. 9 - \frac{1}{3}(9) = 8 \frac{2}{3}$$

$$iii. -10 - \frac{1}{3}(9) = -10 \frac{3}{3}$$

$$iv. +15 - \frac{1}{3}(-2) = -14 \frac{2}{3}$$

$$v. 2 - \frac{1}{3}(-1) = \frac{7}{3}$$

$$vi. -53 - \frac{1}{3}(2) = -53 \frac{2}{3}$$

$$\text{so new } R_{02} = (0, 8, \frac{20}{3}, -10, -14 \frac{2}{3}, \frac{7}{3}, -53 \frac{2}{3})$$

Thus is new set of augmented matrix:

$$\left[ \begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & \frac{7}{3} & -2 & -\frac{19}{3} & \frac{4}{3} & -9 \\ 0 & 0 & 4 & -6 & -8 & 7 & -35 \\ 0 & 0 & -\frac{2}{3} & 6 & \frac{24}{3} & -\frac{2}{3} & 86 \\ 0 & 0 & \frac{22}{3} & -10 & -\frac{20}{3} & \frac{7}{3} & -45 \end{array} \right]$$

to make  $q_3 = 0$ , we have,  $R_{03} = (\frac{1}{3} \times R_{02}) + R_{01}$

$$i. 4 - \frac{12}{3} \left( \frac{1}{3} \right) = 0$$

$$ii. +6 - \left( \frac{22}{3} \right) \left( -\frac{2}{3} \right) = \frac{18}{3}$$

$$iii. -8 - \left( \frac{12}{3} \right) \left( \frac{19}{3} \right) = -\frac{4}{3}$$

$$iv. 7 - \left( \frac{16}{3} \right) \left( \frac{7}{3} \right) = \frac{61}{3}$$

Row 2

$$v \quad 436 - \frac{2}{7}(-11) = \frac{230}{7}$$

$$\text{New Row 5} = \begin{bmatrix} 0 & 0 & 0 & \frac{38}{7} & \frac{28}{7} & -2/7 & \frac{230}{7} \end{bmatrix}$$

To make  $a_{03} = 0$ , we have  $\text{Row 6} = \text{Row 6} - \frac{22}{7} \text{Row 5}$

$$i \quad \frac{62}{3} - \frac{22}{7} \left( \frac{28}{7} \right) = 0$$

$$ii \quad -10 - \frac{22}{7}(-2) = -\frac{26}{7}$$

$$iii \quad -\frac{40}{3} - \frac{22}{7} \left( -\frac{18}{3} \right) = \frac{2}{3}$$

$$iv \quad \frac{7}{3} - \frac{22}{7} \left( \frac{4}{3} \right) = -\frac{13}{7}$$

$$v \quad -47 - \frac{22}{7}(-11) = -\frac{57}{7}$$

$$\text{New Row 6} = \begin{bmatrix} 0 & 0 & 0 & -\frac{26}{7} & \frac{2}{7} & -\frac{13}{7} & -\frac{57}{7} \end{bmatrix}$$

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 & 11 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 & -113/7 \\ 0 & 0 & 0 & 38/7 & 38/7 & 2/7 & 230/7 \\ 0 & 0 & 0 & -26/7 & 2/7 & -13/7 & -57/7 \end{bmatrix}$$

Row 3

To make  $a_{24} = 0$ , we have  $\text{Row 5} = \left[ \frac{38}{7} \right] \times \text{Row 4} + \text{Row 5} + \frac{17}{9} \text{Row 4}$

$$i \quad \frac{38}{7} + \frac{17}{9} \left( -\frac{18}{7} \right) = 0$$

$$ii \quad \frac{38}{7} + \frac{17}{9} \left( -\frac{4}{7} \right) = \frac{56}{7}$$

$$\begin{aligned} \text{III} \quad & -\frac{7}{4} + \frac{37}{4} \left( \frac{13}{4} \right) = \frac{77}{4} \\ \text{IV} \quad & \frac{520}{4} - \frac{17}{4} \left( \frac{13}{4} \right) = -\frac{11}{4} \end{aligned}$$

The new Row 5 =  $\begin{bmatrix} 0 & 0 & 0 & 0 & 28/4 & 27/5 & 11/4 \end{bmatrix}$

We make  $a_{54} = 0$ ; we have Row 6 =  $13/4$  Row 5

$$-\frac{26}{4} = \frac{13}{4} \left( -\frac{8}{4} \right) = 0$$

$$\frac{7}{4} = \frac{13}{4} \left( -\frac{4}{4} \right) = \frac{13}{4}$$

$$\text{III} \quad -\frac{13}{4} = \frac{13}{4} \left( \frac{65}{4} \right) = -\frac{26}{4}$$

$$\text{IV} \quad -\frac{87}{4} = \frac{13}{4} \left( \frac{-115}{4} \right) = \frac{28}{4}$$

The new Row 6 =  $\begin{bmatrix} 0 & 0 & 0 & 0 & 10/4 & -26/5 & \frac{11}{4} \end{bmatrix}$

$$\text{Row 6} \begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 7/3 & -2 & -13/4 & 7/4 & 11 \\ 0 & 0 & 0 & -10/4 & -4/4 & 28/4 & -28/4 \\ 0 & 0 & 0 & 0 & 28/4 & 27/5 & 11/4 \\ 0 & 0 & 0 & 0 & 10/4 & -26/5 & 11/4 \end{bmatrix}$$

We make  $a_{64} = 0$ ; Row 6 =  $\left( \frac{10}{4} \div \frac{10}{4} \right) \times \text{Row 5}$

$$\Rightarrow \text{Row 6} = \frac{10}{38} \times \text{Row 5}$$

$$\frac{11}{4} = \frac{10}{38} \left( \frac{28}{4} \right) = 0$$

$$\frac{26}{3} = \frac{10}{38} \left( \frac{27}{3} \right) = \frac{215}{19}$$

$$\frac{-10}{38} \left( \frac{-11}{4} \right) = \frac{215}{19}$$



$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -6 & -1 & 12 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 & -11 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 & -23/7 \\ 0 & 0 & 0 & 0 & 56/7 & 24/7 & -11/7 \\ 0 & 0 & 0 & 0 & 0 & -213/19 & 215/19 \end{bmatrix}$$

Back Substitution

$$-213/19 r_6 = 215/19$$

$$r_6 = 210/19 \quad / -213/19 \quad z = -1$$

$$24/3(-1) + 33/7 r_5 = -110/7$$

$$r_5 = \frac{-110/7 + 24/3}{33/7}$$

$$56/7 r_4$$

$$-18/7 r_4 - 4/7 r_5 + 33/7 r_6 = -113/7$$

$$= -18/7 r_4 - 4/7 (2) + 33/7 (-1) = -113/7$$

$$r_4 = \frac{-113/7 + 33/7 + 8/7}{-18/7}$$

$$= 4 //$$

$$w \quad \frac{7}{5}T_3 - 2T_4 - \frac{1}{3}T_5 + \frac{1}{3}T_6 = -11$$

$$\frac{7}{5}T_3 - 2(4) - \frac{1}{3}(2) + \frac{1}{3}(-2) = -11$$

$$T_3 = \frac{-11 - 1\frac{2}{3} + \frac{2}{3} + 15}{7/5}$$

$$= \underline{\underline{3}}$$

$$v \quad -5T_2 + 5T_3 + 3T_4 - 5T_5 + 1T_6 = 12$$

$$-5T_2 + 5(3) + 3(4) - 5(2) + 1(-2) = 12$$

$$T_2 = \frac{12 - 15 + 12 - 10 + 2}{-5}$$

$$= -2$$

$$u \quad T_1 + T_2 - 2T_3 + T_4 + 3T_5 - T_6 = 6$$

$$T_1 + (-2) - 2(3) + 4 + 3(2) - 1(-1) = 6$$

$$T_1 - 2 - 6 + 4 + 6 + 1 = 6$$

$$T_1 = 6 - 9$$

$$T_1 = -3$$