Name Tonbra James [illegible]
15/ENG02/12
Petroleum Engineering

$I_1 + I_2 - 2I_3 + I_4 + 3I_5 - I_6 = 4$

$2I_1 - I_2 + I_3 + 2I_4 - I_5 - 3I_6 = 20$

$I_1 + 3I_2 - 3I_3 - I_4 + 2I_5 + I_6 = -15$

$5I_1 + 2I_2 - I_3 + I_4 + 2I_5 + I_6 = -3$

$-3I_1 + I_2 + 2I_3 + 3I_4 + I_5 + 3I_6 = 16$

$4I_1 + 3I_2 + I_3 - 6I_4 - 3I_5 - 2I_6 = -27$

Solution

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 3 & -1 \\ 2 & -1 & 1 & 2 & 1 & -3 \\ 1 & 3 & -3 & -1 & 2 & 1 \\ 5 & 2 & -1 & 1 & 2 & 1 \\ -3 & 1 & 2 & 3 & 1 & 3 \\ 4 & 3 & 1 & -6 & -3 & -2 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \\ I_5 \\ I_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 20 \\ -15 \\ -3 \\ 16 \\ -27 \end{bmatrix}$$

The augmented form

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 2 & -1 & 1 & 2 & 1 & -3 & 20 \\ 1 & 3 & -3 & -1 & 2 & 1 & -15 \\ 5 & 2 & -1 & 1 & 2 & 1 & -3 \\ -3 & 1 & 2 & 3 & 1 & 3 & 16 \\ 4 & 3 & 1 & -6 & -3 & -2 & -27 \end{array}\right]$$

Row2 $- \frac{2}{1}$ Row1

$2 - \frac{2}{1} \times 1 = 0$

$-1 - 2 \times 1 = -3$

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

$2 - 2 \times 1 = 0$

$1 - 2 \times 3 = -5$

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

$20 - 2 \times 4 = 12$

Row3 $- \frac{-3}{1}$ Row1

$1 + 1 \times 1 = 0$

$3 - 1 \times 1 = 2$

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

$-1 - 1 \times 1 = -2$

$2 - 1 \times 3 = -3$

$1 - 1 \times (-1) = 2$

$-15 - 1 \times 4 = -19$

Row4 $- \frac{5}{1}$ Row1

$5 - \frac{5}{1} \times 1 = 0$

$2 - 5 \times 1 = -3$

$-1 - 5 \times (-2) = 9$

$-1 - 5 \times 1 = -6$

$2 - 5 \times 3 = -13$

$1 - 5 \times (-1) = 6$

$-3 - 5 \times 4 = -23$

Row5 $- (\frac{-3}{1})$ Row1

$-3 + 3 \times 1 = 0$

$-1 + 3 \times 1 = 2$

$2 + 3 \times (-2) = -4$

$3 + 3 \times 1 = 6$

$1 + 3 \times 3 = 10$

$3 + 3 \times (-1) = 0$

$16 + 3 \times 4 = 28$

Row6 $- \frac{4}{1}$ Row1

$4 - 4 \times 1 = 0$

$3 - 4 \times 1 = -1$

$1 - 4 \times (-2) = 9$

$-6 - 4 \times 1 = -10$

$-3 - 4 \times 3 = -15$

$-2 - 4 \times (-1) = 2$

$-27 - 4 \times 4 = -43$

Scanned by CamScanner

Modify Row2, Row3, Row4, Row5 and Row6

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 2 & -1 & -2 & -1 & 2 & -19 \\ 0 & -5 & 9 & -6 & -15 & 6 & -23 \\ 0 & 2 & -4 & 6 & -10 & 0 & 28 \\ 0 & -1 & 9 & 10 & -15 & 2 & -43 \end{array}\right]$$

Row3 + 2/3 Row2

$2 + 2/3 \times (-3) = 0$

$-1 + 2/3 \times 5 = 7/3$

$-2 + 2/3 \times 0 = -2$

$-1 + 2/3 \times (-5) = -13/3$

$2 + 2/3 \times (-1) = 4/3$

$-19 + 2/3 \times 12 = -11$

Row4 − 3/2 Row3

$-5 + 3/2 \times 2 = 0$

$9 + 3/2 \times (-1) = 15/2$

$-6 + 3/2 \times (-2) = -9$

$-15 + 3/2 \times (-1) = -29/2$

$6 + 3/2 \times 2 = 9$

$-25 + 3/2 \times (-19) = -103/2$

Row5 − 2/3 Row4

$2 + 2/3 \times (-3) = 0$

$-9 + 2/3 \times 9 = 2$

$6 + 2/3 \times (-6) = 2$

$10 + 2/3 \times (-13) = 4/3$

$0 + 2/3 \times 6 = 4$

$28 + 2/3 \times (-23) = 38/3$

Row6 − (−1/2) Row5

$-1 + 1/2 \times 2 = 0$

$9 + 1/2 \times (-4) = 7$

$-10 + 1/2 \times 4 = -8$

$-15 + 1/2 \times 10 = -10$

$2 + 1/2 \times 0 = 2$

$-43 + 1/2 \times 28 = -29$

Modify Row3, Row4, Row5 and Row6

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 & -11 \\ 0 & 0 & 15/2 & -9 & 29/2 & 9 & -103/2 \\ 0 & 0 & 2 & 2 & -4/3 & 4 & 38/3 \\ 0 & 0 & 7 & -7 & -10 & 2 & -29 \end{array}\right]$$

Row4 − 45/14 Row3

$15/2 - 45/14 \times 7/3 = 0$

$-9 - 45/14 \times (-2) = -18/7$

$-14.5 - 45/14 \times (-13/3) = -4/9$

$9 - 45/14 \times 4/3 = 33/7$

$-103/2 - 45/14 \times (-11) = -\frac{113}{7}$

Row5 − 4/15 Row4

$2 - 4/15 \times 15/2 = 0$

$2 - 4/15 \times (-9) = 22/5$

$4/3 - 4/15 \times (-14.5) = 26/5$

$4 - 4/15 \times 9 = 8/5$

$38/3 - 4/15 \times (-103/2) = 132/5$

Row6 − 7/2 Row5

$7 - 7/2 \times 2 = 0$

$-7 - 7/2 \times 4/3 = -35/3$

$-10 - 7/2 \times 4/3 = -49/3$

$2 - 7/2 \times 4 = -2$

$-29 - 7/2 \times 38/2 = -220/3$

Modify Row4

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 3 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 & -11 \\ 0 & 0 & 0 & -9 & 29/2 & 9 & -103/2 \\ 0 & 0 & 0 & 4 & -10 & 2 & 28 \\ 0 & 0 & 0 & -7 & -10 & 2 & -29 \end{array}\right]$$

Row5 +

$4 - 4 + 7/$

$26/5 + 7$

$8/5 + 7/$

$26 - 4 + 7$

Row6 +

$-14 + 14/$

$-49/3 +$

$-12 + 14/$

$-220/3 +$

Modify R

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & & & & \\ 0 & -3 & 5 & & & & \\ 0 & 0 & 7/ & & & & \\ 0 & 0 & 0 & & & & \\ 0 & 0 & 0 & & & & \\ 0 & 0 & 0 & & & & \end{array}\right]$$

Row6 − 7

$62/3$

$-76/$

$32$

Scanned by CamScanner

Modify Row 4, Row 5 and Row 6

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 5 & -1 & 4 \\ 0 & 3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 & -11 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 & -113/7 \\ 0 & 0 & 0 & 4.4 & 26/5 & 8/5 & 26.4 \\ 0 & 0 & 0 & -14 & -14/3 & -12 & -220/3 \end{array}\right]$$

Row 5 + 77/45 Row 4

$4.4 + 77/45 \times (-18/7) = 0$

$26/5 + 77/45 \times (-4/7) = 33/9$

$8/5 + 77/45 \times 33/7 = 29/3$

$26.4 + 77/45 \times (-113/7) = -11/9$

Row 6 + 14/4.4 Row 5

$-14 + 14/4.4 \times 4.4 = 0$

$-14/3 + 14/4.4 \times (26/5) = 62/33$

$-12 + 14/4.4 \times (8/5) = -76/11$

$-220/3 + 14/4.4 \times (26.4) = 32/3$

Modify Row 5 and Row 6

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 5 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 & -11 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 & -113/7 \\ 0 & 0 & 0 & 0 & 38/9 & 29/3 & -11/9 \\ 0 & 0 & 0 & 0 & 62/33 & -76/11 & 32/3 \end{array}\right]$$

Row 6 − 93/209 Row 5

$62/3 - 93/209 \times 38/9 = 0$

$-76/11 - 93/209 \times 29/3 = -\frac{213}{19}$

$32/3 + 93/209 \times (-11/9) = \frac{213}{19}$

Modify Row 4

$$\left[\begin{array}{cccccc|c} 1 & 1 & -2 & 1 & 5 & -1 & 4 \\ 0 & -3 & 5 & 0 & -5 & -1 & 12 \\ 0 & 0 & 7/3 & -2 & -13/3 & 4/3 & -11 \\ 0 & 0 & 0 & -18/7 & -4/7 & 33/7 & -113/7 \\ 0 & 0 & 0 & 0 & 38/9 & 29/3 & -11/9 \\ 0 & 0 & 0 & 0 & 0 & -\frac{213}{19} & 213/19 \end{array}\right]$$

The matrix form will be,

$$\begin{bmatrix} 1 & 1 & -2 & 1 & 5 & -1 \\ 0 & -3 & 5 & 0 & -5 & 4/3 \\ 0 & 0 & \frac{7}{3} & -2 & \frac{-13}{3} & \frac{52}{7} \\ 0 & 0 & 0 & \frac{-18}{7} & \frac{29}{3} & 29/3 \\ 0 & 0 & 0 & 0 & \frac{38}{9} & 29/3 \\ 0 & 0 & 0 & 0 & 0 & -\frac{213}{19} \end{bmatrix} \begin{bmatrix} T_1 \\ T_2 \\ T_3 \\ T_4 \\ T_5 \\ T_6 \end{bmatrix} = \begin{bmatrix} 4 \\ 12 \\ -11 \\ -\frac{113}{7} \\ -\frac{11}{9} \\ -213/19 \end{bmatrix}$$

$\therefore -\frac{213}{19} T_6 = 213/19$

$T_6 = -1$

$\frac{38}{9} T_5 + 29/3(-1) = -11/9$

$\frac{38}{9} T_5 = -11/9 + \frac{29}{3}$

$\frac{38}{9} T_5 = 76/9$

$9/38 \times 38/9 T_5 = 76/9 \times 9/38$

$T_5 = 2$

$-18/7 T_4 - 4/7 T_5 + 33/7 T_6 = -113/7$

$-18/7 T_4 - 4/7(2) + \frac{33}{7}(-1) = -113/7$

$-18/7 T_4 = -\frac{113}{7} + 8/7 + 33/7$

$-18/7 T_4 = +72/7$

$7/18 \times 18/7 T_4 = 72/7 \times 7/18$

$T_4 = 4$

Scanned by CamScanner

$-3I_2 + 5I_3 - 3I_2 - I_3 = 12$

$-3I_2 + 5(12) - 3(2) - (-4) = 12$

$-3I_2 + 15 - 6 + 4 = 12$

$-3I_2 = 12 - 4 / -3$

$I_2 = 8 / -3$

$I_2 = -2$

$I_1 + I_2 - 2I_3 + I_4 + 5I_5 - I_6 = 4$

$I_1 + (-2) - (-2)(12) + 8 + 5(2) - (-4) = 4$

$I_1 - 2 - 24 + 8 + 10 + 4 = 4$

$I_1 - 2 + 5 = 4$

$I_1 + 3 = 4$

$I_1 = 4 - 3$

$I_1 = 1$ //

Scanned by CamScanner