

DEPARTMENT: PETROLEUM ENG.

ASSIGNMENT 3

Let $T_1 = a$, $T_2 = b$, $T_3 = c$, $T_4 = d$, $T_5 = e$, $T_6 = f$

$$a + b - 2c + d + 3e - f = 4 \quad \dots (1)$$

$$2a - b + c + 2d + e - 3f = 20 \quad \dots (2)$$

$$a + 3b - 3c - d + 2e + f = -15 \quad \dots (3)$$

$$5a + 2b - c - d + 2e + f = -3 \quad \dots (4)$$

$$-3a - b + 2c + 3d + e + 3f = 16 \quad \dots (5)$$

$$4a + 3b + c - 6d - 3e - 2f = -27 \quad \dots (6)$$

Pivot equation is eqn. (1)

$$2(a + b - 2c + d + 3e - f = 4) = 2a + 2b - 4c + 2d + 6e - 2f = 8$$

$$1(a + b - 2c + d + 3e - f = 4) = a + b - 2c + d + 3e - f = 4$$

$$5(a + b - 2c + d + 3e - f = 4) = 5a + 5b - 10c + 5d + 15e - 5f = 20$$

$$-3(a + b - 2c + d + 3e - f = 4) = -3a - 3b + 6c - 3d - 9e + 3f = -12$$

$$4(a + b - 2c + d + 3e - f = 4) = 4a + 4b - 8c + 4d + 12e - 4f = 16$$

Subtract equations

$$2a - b + c + 2d + e - 3f = 20$$

$$- 2a + 2b - 4c + 2d + 6e - 2f = 8$$

$$= -3b + 5c - 5e + f = 12 \quad \dots 2'$$

$$a + 3b - 3c - d + 2e + f = -15$$

$$- a + b - 2c + d + 3e - f = 4$$

$$= 2b - c - 2d - e + 2f = -19 \quad \dots 3'$$

$$5a + 2b - c - d + 2e + f = -3$$

$$- 5a + 5b - 10c + 5d + 15e - 5f = 20$$

$$= -3b + 9c - 6d - 13e + 6f = -23 \quad \dots 4'$$

$$-3a - b + 2c + 3d + e + 3f = 16$$

$$-3a - 3b + 6c - 3d - 9e + 3f = -12$$

$$= 2b - 4c + 6d + 10e = 28 \quad \dots 5'$$

$$4a + 2b + c - 6d - 5e - 2f = -27$$

$$-4a + 4b - 8c + 4d + 12e - 4f = 16$$

$$= -6 + 9c - 10d - 15e + 2d = -43 \quad \dots \dots 6''$$

make equ. (2) new pivot equation:

$$\frac{2}{3}(-3b + 5c - 5e - f = 12) = \frac{2}{3}(-3b + 5c - 5e - f = 12) = -2b - \frac{10c}{3} + \frac{10e}{3} + \frac{2f}{3} = -8$$

$$-\frac{1}{3}(-3b + 5c - 5e - f = 12) = -b + \frac{5c}{3} - \frac{5e}{3} - \frac{1}{3}f = 4$$

$$-\frac{5}{3}(-3b + 5c - 5e - f = 12) = -5b + \frac{25c}{3} - \frac{25e}{3} - \frac{5f}{3} = -20$$

$$\frac{2}{3}(-3b + 5c - 5e - f = 12) = -2b - \frac{10c}{3} + \frac{10e}{3} + \frac{2f}{3} = -8$$

$$-\frac{1}{3}(-3b + 5c - 5e - f = 12) = -b + \frac{5c}{3} - \frac{5e}{3} - \frac{1}{3}f = 4$$

Subtract equations:

$$2b - c - 2d - e + 2f = -19$$

$$-2b - \frac{10c}{3} + \frac{10e}{3} + \frac{2f}{3} = -8$$

$$= \frac{7c}{3} - 2d - \frac{11e}{3} + \frac{4f}{3} = -11 \quad \dots \dots 3''$$

$$-3b + 9c - 6d - 15e + 6f = -23$$

$$-3b + 5c - 5e - f = 12$$

$$= 4c - 6d - 8e + 7f = -35 \quad \dots \dots 4''$$

$$2b - 4c + 6d + 10e = 28$$

$$-2b - \frac{10c}{3} + \frac{10e}{3} + \frac{2f}{3} = -8$$

$$= -\frac{2}{3}c + 6d + \frac{20e}{3} - \frac{2f}{3} = 36 \quad \dots \dots 5''$$

$$-6 + 9c - 10d - 15e + 2f = -43$$

$$-6 + \frac{5c}{3} - \frac{5e}{3} - \frac{1}{3}f = 4$$

$$= \frac{2}{3}c - 10d - \frac{4}{3}e + \frac{2}{3}f = -47 \quad \dots \dots 6''$$

make equ. (3'') new pivot equation

$$\frac{4}{9}(\frac{7}{3}c - 2d - \frac{11}{3}e + \frac{4}{3}f = -11) = \frac{4}{9}(\frac{7}{3}c - 2d - \frac{11}{3}e + \frac{4}{3}f = -11) = \frac{28c}{27} - \frac{8d}{9} - \frac{44e}{27} + \frac{16f}{27} = -\frac{44}{9}$$

$$-\frac{1}{9}(\frac{7}{3}c - 2d - \frac{11}{3}e + \frac{4}{3}f = -11) = -\frac{7c}{27} + \frac{2d}{9} + \frac{11e}{27} - \frac{4f}{27} = \frac{11}{9}$$

$$\frac{2}{9}(\frac{7}{3}c - 2d - \frac{11}{3}e + \frac{4}{3}f = -11) = \frac{14c}{27} - \frac{4d}{9} - \frac{22e}{27} + \frac{8f}{27} = -\frac{22}{9}$$

Subtract equations

$$4c - 6d - 8e + 7f = -15$$

$$- 4c - \frac{24}{7}d - \frac{8}{7}e + \frac{1}{7}f = \frac{-11}{7}$$

$$= -2.5714d - 0.5714e + 4.7142f = -16.1429 \quad 4''$$

$$-\frac{2}{3}c + 6d + \frac{20}{3}e - \frac{5}{3}f = 16$$

$$- -\frac{1}{3}c + \frac{4}{3}d + \frac{10}{3}e - \frac{5}{6}f = \frac{8}{3}$$

$$= 5.42857d + 5.42857e - 0.85714f = 32.85714 \quad 5''$$

$$2\frac{2}{3}c - 10d - \frac{4}{3}e + \frac{2}{3}f = -47$$

$$- \frac{1}{3}c - 4\frac{2}{3}d - \frac{2}{3}e + \frac{2}{3}f = -24\frac{2}{3}$$

$$= -3.71429d + 0.285714e - 1.85714f = -12.4286 \quad 6''$$

Make equ. 4'' new pivot equation

$$-2.1111(-2.5714d - 0.5714e + 4.7142f = -16.1429)$$

$$= 5.42857d + 1.2061e - 9.9521f = 34.0713$$

$$1.4444(-2.5714d - 0.5714e + 4.7142f = -16.1429)$$

$$= -3.71429d - 0.82536e + 6.80947f = 23.31777$$

Subtract equations

$$5.42857d + 5.42857e - 0.28571f = 32.85714$$

$$- 5.42857d + 1.2061e - 9.9521f = 34.0713$$

$$= 4.2222e + 9.66639f = -1.2222 \quad 7''$$

$$-3.71429d + 0.285714e - 1.85714f = -12.4286$$

$$- -3.71429d - 0.82536e + 6.80947f = 23.31777$$

$$= 7.1111e - 8.6667f = 10.8889 \quad 8''$$

And eq. 5'' new pivot equation

$$0.2632(4.2222e + 9.66639f = -1.2222)$$

$$= 1.1111e + 2.5442f = -0.37169$$

$$1.1111e - 8.6667f = 10.8889$$

$$- 1.1111e + 2.5442f = -0.37169$$

$$= -11.2109f = 11.2106$$

$$f = \frac{11.2106}{11.2109} = -0.999732 \approx -1$$

$$1.1111e = 9.6667(-1) = 10.889$$

$$c = \frac{10.889 - 9.6667}{1.1111} = 2$$

$$-3.71429d + 0.285714(2) - 1.85714(-1) = -12.4286$$

$$d = \frac{-12.4286 - 0.571428 - 1.85714}{-3.71429} = 4$$

from eqn. (4'')

$$4c - 6d - 8e + 7f = -35$$

$$c = \frac{-35 + 47}{4} = \frac{12}{4} = 3$$

from eqn. (3')

$$2b - c - 2d - e + 2f = -19$$

$$2b - 3 - 2(4) - 2 + 2(-1) = -19$$

$$2b - 3 - 8 - 2 - 2 = -19$$

$$b = \frac{-19 + 15}{2} = \frac{-4}{2} = -2$$

from eqn. (1)

$$a + b - 2c + d + 3e - f = 4$$

$$a - 2 - 2(3) + 4 + 3(2) - (-1) = 4$$

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

$$a = 4 - 3 = 1$$

$$a = 1, b = -2, c = 3, d = 4, e = 2, f = -1$$

$$T_1 = 1, T_2 = -2, T_3 = 3, T_4 = 4, T_5 = 2, T_6 = -1$$