Agboola Abiola

171sci01007

Computer science

CSC314

Answer

1. $x + 2y \leq 10$

when $x = 0$ $y = 5$

when $y = 0$ $x = 10$

$x + y \leq 6$

when $x = 0$ $y = 6$

when $y = 0$ $x = 6$

$x - y \leq 2$

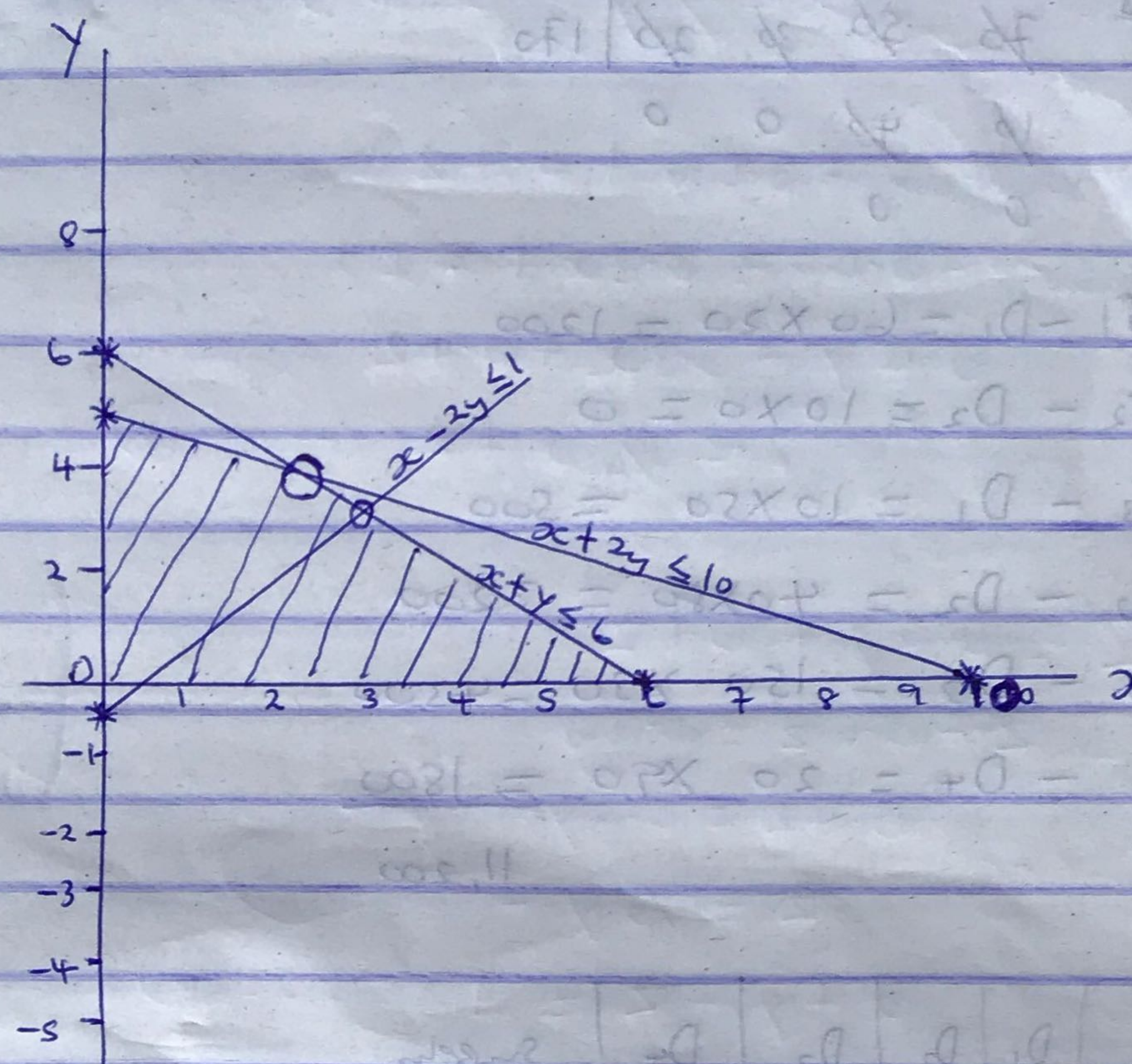
when $x = 0$ $y = 2$

when $y = 0$ $x = 2$

$x - 2y \leq 1$

when $x = 0$ $y = -1/2$

when $y = 0$ $x = 1$




$A(0,5)$ $A = 2(0) + 5 = 5$

$B(2,4)$ $B = 2(2) + 4 = 8$

$C(2.5, 3.7)$ $C = 2(2.5) + 3.7 = 8.7$

$D(6,0)$ $D = 2(6) + 0 = 12$

$E(0,0)$ $E = 2(0) + 0 = 0$

2:

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | 6 |
|---|---|---|---|---|---|
| S1 | $\boxed{10}$ 20 | 50 30 | – 100 | – 170 | ~~60~~ ~~10~~0 |
| S2 | – 10 | 1 0 | – 60 | $\boxed{10}$ 10 | ~~10~~0 |
| S3 | $\boxed{60}$ 50 | 1 80 | $\boxed{30}$ 180 | $\boxed{10}$ 190 | ~~100~~ ~~70~~ ~~60~~ 0 |
| Demand | ~~70~~ ~~60~~ 0 | ~~50~~ 0 | ~~30~~ 0 | ~~20~~ ~~10~~ 0 | 170 |

| | $P_1$ | $P_2$ | $P_3$ | $P_4$ | $P_5$ | $P_6$ |
|---|---|---|---|---|---|---|
| | 10 | 10 | 50 | x | x | x |
| | 10 | x | x | x | x | x |
| | 30 | 30 | 40 | 40 | 40 | 50 |

| | | | | |
|---|---|---|---|---|
| $P_1$ | 10 | 30 | 50 | 60 |
| $P_2$ | 30 | 50 | 40 | 20 |
| $P_3$ | 30 | x | 40 | 20 |
| $P_4$ | 50 | x | 180 | 90 |
| $P_5$ | 50 | x | x | 90 |
| $P_6$ | 50 | x | x | x |

$(10 \times 20) + (50 \times 30) + (10 \times 10)$

$(60 \times 50) + (30 \times 180) + (10 \times 10)$

$= 10,200$

ii

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
|---|---|---|---|---|---|
| S1 | $\boxed{60}$ 20 | 30 | 110 | 70 | ~~60~~ 0 |
| S2 | 10 | $\boxed{10}$ 0 | 60 | 10 | ~~10~~ 0 |
| S3 | $\boxed{10}$ 50 | $\boxed{40}$ 80 | $\boxed{30}$ 150 | $\boxed{120}$ 90 | ~~120~~ ~~90~~ ~~50~~ ~~20~~ 0 |
| Demand | ~~70~~ ~~10~~ 0 | ~~50~~ ~~40~~ 0 | ~~30~~ 0 | ~~20~~ 0 | 170 |

$S1 - D_1 = 60 \times 20 = 1200$

$S_2 - D_2 = 10 \times 0 = 0$

$S_3 - D_1 = 10 \times 50 = 500$

$S_3 - D_2 = 40 \times 80 = 3200$

$S_3 - D_3 = 150 \times 30 = 4500$

$S_3 - D_4 = 20 \times 90 = 1800$

11,200

iii

| | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
|---|---|---|---|---|---|
| $S_1$ | $\boxed{60}$ 20 | – 30 | – 110 | – 70 | ~~60~~ 0 |
| $S_2$ | $\boxed{10}$ 10 | – 0 | – 60 | – 10 | ~~10~~ 0 |
| $S_3$ | 1 50 | $\boxed{50}$ 80 | $\boxed{30}$ 150 | $\boxed{20}$ 90 | ~~100~~ ~~50~~ ~~30~~ ~~20~~ 0 |
| Demand | ~~70~~ ~~10~~ 0 | 50 | 30 | 20 | 170 |

$S_1 - D_1 = 60 \times 20 = 1200$

$S_2 - D_1 = 10 \times 10 = 100$

$S_3 - D_2 = 50 \times 80 = 4000$

$S_3 - D_3 = 150 \times 30 = 4500$

$S_3 - D_4 = 90 \times 20 = 1800$

11,600

Note: Comment;

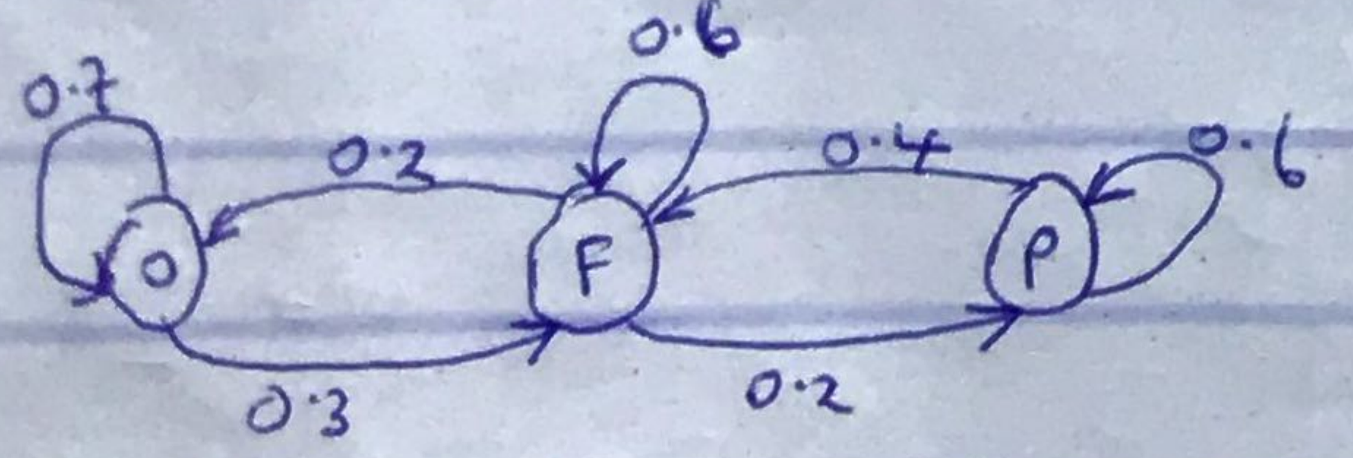
Vogel's Approximation Method (VAM) or Penalty method is preferred over the North West and Least approximation method because the initial basic feasible solution obtained by this method is either optimal solution or very nearer to the ~~exist~~ optimal solution.

## Section B.

3. Let O = Outstanding

F = Fair

P = Poor




b)

|   | O | F | P |   |
|---|---|---|---|---|
| O | 0.7 | 0.3 | 0 | = 1 |
| F | 0.2 | 0.6 | 0.2 | = 1 |
| P | 0 | 0.4 | 0.6 | = 1 |

$$P = \begin{pmatrix} 0.7 & 0.3 & 0 \\ 0.1 & 0.6 & 0.2 \\ 0 & 0.4 & 0.6 \end{pmatrix}$$

1st transition

$$P(1) = P^{(0)} \cdot P$$

$$= (0,3 \quad 0.6 \quad 0.1) \begin{pmatrix} 0.7 & 0.3 & 0 \\ 0.2 & 0.6 & 0.2 \\ 0 & 0.4 & 0.6 \end{pmatrix}$$

$$P(1) = (0.33 \quad 0.49 \quad 0.18)$$

$$P^{(2)} = P^{(1)} \cdot P$$

For two transitions.

$$(0.33 \cdot 0.49 \quad 0.18) \begin{pmatrix} 0.7 & 0.3 & 0 \\ 0.2 & 0.6 & 0.2 \\ 0 & 0.4 & 0.6 \end{pmatrix}$$

$$P^{(2)} = (0.329, \quad 0.465, \quad 0.206)$$

c) $$(x, y, z) \begin{pmatrix} 0.7 & 0.3 & 0 \\ 0.2 & 0.6 & 0.2 \\ 0 & 0.4 & 0.6 \end{pmatrix}$$

$X = 0.7x + 0.2y$

$x - 0.7x = 0.2y$

$0.3x = 0.2y$

$x = \frac{2}{3}y$ ------ (1)

$Y = 0.3x + 0.6y + 0.4z$

$y - 0.6y = 0.3x + 0.4z$

$0.4y = 0.3x + 0.4z$

$Y = \frac{3}{4}x + z$ ------ (2)

$Z = 0.2y + 0.6z$

$z - 0.6z = 0.2y$

$0.4z = 0.2y$

$z = \frac{1}{2}y$ ------ (3)

$x + y + z = 1$ ---- (4)

4. Arrival rate $= \lambda = \frac{200}{40} = 5$

Service rate $= \mu = \frac{480}{80} = 6$

a. Traffic intensity $= S = \frac{\lambda}{\mu} = \frac{5}{6} = 0.83$

b. Average number of item in the queue $= \frac{\lambda^2}{\mu(\mu - \lambda)} = \frac{5^2}{6(6-5)} = 4.17$

c. Average number of item in the system $= \frac{\lambda}{\mu - \lambda} = \frac{5}{6-5} = 5$

d. Average time in the queue before service rendered $= \frac{\lambda}{\mu(\mu - \lambda)} = \frac{5}{6(6-5)} = 0.83.$

e. Average time in a system $= \frac{1}{(\mu - \lambda)} = \frac{1}{6-5} = \underline{\underline{1}}$

6.

| $J_1$ | $J_2$ | $J_3$ |
|---|---|---|
| 25 | 15 | 22 |
| 31 | 20 | 19 |
| 35 | 24 | 17 |

Row reduction

| | | |
|---|---|---|
| 10 | 0 | 7 |
| 12 | 1 | 0 |
| 18 | 7 | 0 |

Column reduction

| | | |
|---|---|---|
| 0 | 0 | 7 |
| 2 | 1 | 0 |
| 8 | 7 | 0 |

∴

| | | |
|---|---|---|
| 0 | 0 | 7 |
| 2 | 1 | 0 |
| 8 | 7 | 0 |

| | | |
|---|---|---|
| 0 | 0 | 8 |
| 1 | 0 | 0 |
| 7 | 0 | 0 |

Since $N = n$

∴

| $J_1$ | $J_2$ | $J_3$ |
|---|---|---|
| 0 | 0 | 8 |
| 1 | 0 | 0 |
| 1 | 6 | 0 |

$X \cdot X = 28$

$Y = 20$

$Z = 17$

$62$