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Roll No# 003

Programme: BSSE

OR Assignment

Question no #1

Time Period Covered

Time Period	1	2	3 shift	4	5	minimum number of Agents needed
6 Am to 8:00am	✓					48
8:00 Am to 10 am	✓	✓				79
10 am to Noon	✓	✓				65
Noon to 2 pm	✓	✓	✓			87
2pm to 4pm		✓	✓			64
4pm to 6pm			✓	✓		73
6pm to 8pm / 8pm to 10pm			✓	✓		82
10 pm to Midnight				✓		43
midnight to 8am				✓	✓	52
Daily Cost Per Agent						25

Minimize $Z = 170x_1 + 160x_2 + 175x_3 + 180x_4 + 195x_5$

Subject to

$x_1 >= 48 \rightarrow (a)$

$x_1 + x_2 >= 79 \rightarrow (b)$

$x_1 + x_2 >= 65 \rightarrow (c)$

$x_1 + x_2 + x_3 >= 87 \rightarrow (d)$

$x_2 + x_3 >= 64 \rightarrow (e)$

$x_3 + x_4 >= 73 \rightarrow (f)$

$x_3 + x_4 >= 82 \rightarrow (g)$

$x_4 >= 43 \rightarrow (h)$

$x_4 + x_5 >= 52 \rightarrow (i)$

$x_5 >= 15 \rightarrow (j)$

from eq (a), (b) & j

$x_1 = 48$

$x_4 = 43$

$x_5 = 15$

as in eq (c), 65 is lesser than 79 in eq (b) So we neglect eq (c) now we have

$x_1 + x_2 = 79$

Putting the value of x_1

$49 + x_2 = 79$

$x_2 = 32$

For x_3, we take eq (g) as in eq (g), 82 is greater than other eq (t, h, e) & of so taking eq (g) $x_3 + x_4 = 82$

$$x_3 + 43 = 82$$
$$x_3 = 39$$

Now we have $(x_1, x_3, x_3, x_4, x_5)$ values 48, 32, 39, 43, 15 respectively.

Now the minimize equation:

$$Z = 170x_1 + 160x_2 + 175x_3 + 180x_4 + 195x_5$$
$$= 170(48) + 160(31) + 175(39) + 180(43) + 195(15)$$
$$Z = 30650$$

Question no # 2

1) Maximize Subject to:

→ $Z = x_1 - 3x + 3x^3$

to

$3x1 - x2 + 2x3 \leq 7$

$-2x1 - 4x2 \leq 12$

$-4x1 + 3x2 + 8x2 \leq 10$

Solution:

$7 = x1 - 3x2 + 3x3$

$3x1 - x2 + 2x3 + S_1 = 7$

$-2x1 - 4x2 + 0 \cdot S_1 + S_2 = 12$

$-4x_1 + 3x_2 + 8x_3 + 0 \cdot S_1$

$+ 0 \cdot S_2 + S_3 = 12$

	C_j	7	-3	3	0	0	0		
CB	Basis	x_1	x_2	x_3	S_1	S_2	S_3	B	θ
0	S_1	3	-2	2	1	0	0	7	
0	S_2	-2	-4	0	0	1	0	12	
0	S_3	-4	3	8	0	0	1	10	
	$\sum CB$ $z_j = ql$	0	0	0	0	0	0	0	
	~~$c_j - z_j$~~ $c_j - c_j = z_j$	7	-3	3 Key	0 Column	0	0		

(Not Possible)

2)

$Z = 5x_1 + 3x_2$

Minimize to:

$x_1 + x_2 \; L = 2$

$5x_1 + 2x_2 \; L = 10$

$3x_1 + 8x_2 \; L = 12$

$Z = 5x_1 + 3x_2 + 0S_1 + 0S_2 + 0S_3$

$x_1 + x_2 + S_1 + 0S_2 + 0S_3 = 2$

$5x_1 + 2x_2 + 0S_1 + S_2 + S_3 = 10$

$3x_1 + 8x_2 + 0S_1 + 0S_2 + S_3 = 12$

3

Cj	5	3	0	0	0		
Basic	x_1	x_2	S_1	S_2	S_3	B	θ
S_1	1	1	1	0	0	2	$\theta_1 = 2$
S_2	5	2	0	1	0	10	$10/2 = 5$
S_3	3	8	0	0	1	12	$12/3 = 1.5$
Zi ΣCB aij	0	0	0	0	0	0	
Cj-Cj=Zj	5	3	0	0	0		

x_2 is the key colomn as

3 is minimum value in Cj

S_2 is key row as 5 is max value

2 is key element

Cj Z = 0 for Minimization function

here is no negative value

in Cj

$x_1 = 0 \quad x_2 = 0 \quad Min(Z) = 0$

So

$Z = 5(0) + 3(0)$

$= 0$

3) $Z = 2x_1 - x_2 + 2x_3$

Maximize Subject to

$2x_1 + x_2 \leq 10$

$x_1 + 2x_2 - 2x_3 \leq 20$

$x_1 + 2x_3 \leq 5$

$L = 2x_1 - x_2 + 2x_3 + 0S_1 + 0S_2 + 0S_3$

$2x_1 + x_2 + 0x_3 + S_1 + 0S_2 + 0S_3 = 10$

$x_1 + 2x_2 - 2x_3 + 0S_1 + S_2 + S_3 = 20$

$x_1 + 0x_2 + 2x_3 + 0S_1 + S_2 + S_3 = 5$

	C_j								
CB	Basic	x_1	x_2	x_3	S_1	S_2	S_3	B	θ
	S_1	2	1	0	1	0	0	10	$10/2 = 5$
	S_2	1	2	-2	0	1	0	20	$20/1 = 20$
	S_3	1	0	2	0	0	1	5	$5/1 = 5$
$Z_j = \Sigma(c_j - a_{ij})$		0	0	0	0	0	0	0	0
$C_j = C_j - Z_j$		2	-1	-1	2	0	0	0	
		Key	Colum						

1 is the key element.

$R_1 \Rightarrow R_1 - 2R_3 = 0$

$R_2 \Rightarrow R_2 - R_3 = 0$

$Cj\ C = 0$

	Cj	2	-1	2	0	0	0	
CB	Basic	x_1	x_2	x_3	S_1	S_2	S_3	B
0	S_1	0	1	-4	1	0	-2	0
0	S_2	0	2	-4	0	1	-2	15
2	x_1	1	0	2	0	0	1	5
	$Zj = \sum Cj - yj$	2	0	4	0	0	2	10
	$Cj = Cj - Cj$	0	-1	-2	0	0	-2	

Optimal Solution

$x_1 = 5 \quad x_2 = 0 \quad x_3 = 0$

Z (maximum Value) = 10

Check:.

$Z = 2x_1 - x_2 + 2x_3$

$= 2(5) - 0 + 2(0)$

$Z = 10$ (Confirmed)