

QUESTION: 2 (A):.

MINI-MAX REGRET:-

Regret = Opportunity lost

= Best pay off - Pay off demand

		DAILY DEMAND			
Daily Supply	No of Ladies	40	50	60	70
	40	80	80	80	80
	50	0	100	100	100
	60	80	20	120	120
	70	160	60	40	140

FIRST STEP:-

	40	50	60	70
40	160-80=80	20	40	60
50	160	0	20	40
60	80	80	0	20
70	0	40	80	0

SECOND STEP:-

	40	50	60	70	Max
40	80	20	40	60	160
50	160	0	20	40	80
60	80	80	0	20	80
70	0	40	80	0	60

QUESTION: 2 (B):-

PART: (i):-

DIJKSTRA'S ALGORITHM:-

	A	B	C	D	E	F	G	H	I
A	0	270	250	2000	4700	5900	12900	540	2070
B	0	0	0	0	0	0	0	0	1800
C	0	0	0	0	0	0	0	290	2000
D	0	0	750	0	2700	3900	10900	12200	2000
E	0	0	450	0	0	1200	0	740	24500
F	0	0	0	0	0	0	7000	1300	2500
G	0	0	0	0	0	0	0	1300	2500
H	0	0	0	0	0	0	0	0	2500
I	0	0	0	0	0	0	0	0	0

PART: (ii):-

ASSUMPTION IN USING DIJKSTRA

IN PART (i):-

$A \rightarrow I, B \rightarrow I; C \rightarrow I$

$D \rightarrow I, E \rightarrow I, F \rightarrow I$

$G \rightarrow I; H \rightarrow I$

QUESTION: 4::

PART: C::

(i) $3 \rightarrow 2 \rightarrow 1 \rightarrow 1 \rightarrow 3$

SOLUTION:-

$$P(3, 2, 1, 1, 1, 3) = P(X_0=3) \times P_{32} \times P_{21} \times P_{11} \times P_{13}$$
$$= \frac{1}{3} \times 0.8 \times 0.4 \times 0.6 \times 0.2$$

$$= 0.0128$$

(ii) $2 \rightarrow 3 \rightarrow 3 \rightarrow 3$

SOLUTION:-

$$P(2, 3, 3, 3) = P(X_0=2) \times P_{23} \times P_{33} \times P_{33}$$
$$= \frac{1}{2} \times 0.6 \times 0.2 \times 0.2$$

$$= 0.012$$

QUESTION: 4:-

PART: D:-

SOLUTION:-

$$\tilde{u}^t = \left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3} \right)$$

$$\tilde{u}^t P = \left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3} \right) \begin{pmatrix} 0.6 & 0.2 & 0.2 \\ 0.4 & 0 & 0.6 \\ 0 & 0.8 & 0.2 \end{pmatrix}$$

Thus

$$X \sim \left(\frac{1}{3}, \frac{1}{3}, \frac{1}{3} \right)$$

and Therefore

$$\boxed{= \frac{1}{3}}$$

PART: A:- (i)

SOLUTION:-

let x = no of audits.

y = no of tax return.

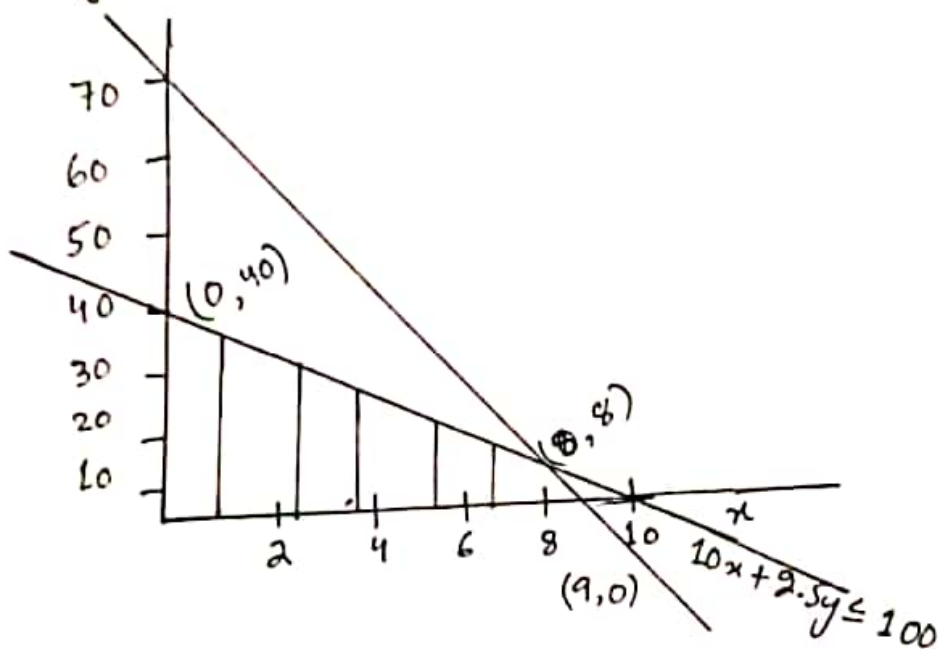
Constraints:

$$100x + 12.5y = 900$$

$$10x + 2.5y \leq 100$$

$$x \geq 0$$

$$y \geq 0$$



$$\text{Objective fn} = R = 2000x + 300y$$

$$\text{at } (0, 0) = R = 0$$

$$\text{at } (0, 40) = R = 300(40) = 12,000$$

$$\text{at } (8, 8) = R = 2000(8) + 300(8)$$

$$= 18,400$$

$$\text{at } (9, 0) = R = 2000(9) = 18,000$$

⇒ The revenue will be maximum of 18,400 if the firm does 8 audits and 8 tax returns each week.

$$\begin{array}{rcl} 100x + 12.5y = 900 & & 100x + 12.5y = 900 \\ 10x + 2.5y = 100 & \longrightarrow & -100x - 2.5y = -1000 \\ \hline & & -12.5y = -100 \\ & & \boxed{y = 8} \end{array}$$

$$\Rightarrow 100x + 12.5y = 900 \rightarrow \textcircled{A}$$

put value of $y = 8$ in this Eq $\textcircled{A}$

$$100x + 12.5(8) = 900$$

$$100x = 800$$

$$x = \frac{800}{100}$$

$$x = 8$$

$$\boxed{\text{So } \{x, y\} = 8, 8.}$$

REQUIREMENT: 2:-

No of audits	No of tax return	Return
0	0	12,000
→ 8	8	18,400
9	0	18,000

→ Point of Maximum Profit.

REQUIREMENT: 3:-

PART: (i):-

→ Variable $(x, y) = (0, 0)$ will enter the basis.

→ Variable $(x, y) = [8, 8]$ will depart the basis.

Part: (ii):-

Optimal Solution:-

$$\text{If } \{x, y\} = \{8, 8\}$$

$$R = 2000x + 300y$$

$$R = 2000(8) + 300(8)$$

$$\boxed{R = 18,400}$$

The firm will get optimal Revenue.

PART: B:-

SOLUTION:-

GIVEN:-

→ A factory can produce four products denoted by P_1, P_2, P_3 and P_4

→ Each product can be processed in two workshops

Processing Time In Hours Per Unit Produced is given as;

	P_1	P_2	P_3	P_4
Workshop 1	3	4	8	6
Workshop 2	6	2	5	8

→ 400 labour hours are available in each workshop.

→ Profit margins are 4, 6, 10 and 9 per unit produced.

Linear Program for Maximising profits:

Max $\Rightarrow$

$$4x_1 + 6x_2 + 10x_3 + 9x_4$$

$$3x_1 + 4x_2 + 8x_3 + 6x_4 \leq 400$$

$$6x_1 + 2x_2 + 5x_3 + 8x_4 \leq 400$$

$$x_1, x_2, x_3, x_4 \geq 0$$

⇒ Introducing stock variables S_1 and S_2 , applying simplex method, we get final table:

Z	P_1	P_2	P_3	P_4	S_1	S_2	RHS
1	0.5	0	2	0	1.5	0	600
0	0.75	1	2	1.5	0.25	0	100
0	4.5	0	1	5	-0.5	1	200

PART: A:-

SOLUTION:-

→ From final table $x_2 = 100$ is basic
 → and $x_1 = x_3 = x_4 = 0$ are non-basic.

So 100 units of P_2 should be produced and none of P_1 , P_3 and P_4 . The resulting profit is \$ 600.
 and this is maximum profit.

PART: B:-

SOLUTION:-

The reduced cost for x_3 is 2.

Thus Effect on profit of producing x_3 units of P_3 is $-2x_3$. If 20 units of P_3 have been produced by mistake then profit will be $2 \times 20 = \$40$ lower than maximum than a.
 (making co-efficient for x_3 and replace $b_2 = 20$).

Part: C :-

ANSWER :-

→ If factory is willing to extend number of labour hours, it may reduce employment in short run, but may increase in long run if hourly pay remains constant. So it has great impact on rate of profit.

More Labour Hours :-

More Hours worked higher incomes but can reduce amount of leisure that workers enjoy.