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18BECE30558 TITHI PATEL.

6. Let x_1 be the amount invested in security 'A' and let x_2 be the amount invested in security 'B'

	x_1	x_2	
return.	0.09	0.15	min return $0.12(x_1+x_2)$
risk factor	0.5	0.8	max risk $0.6(x_1+x_2)$

Objective is to maximise return.

$\max Z = 0.09x_1 + 0.15x_2$

(given total investment to be made $x_1 + x_2 = 5,00,000$)

Constraints:

① $0.09x_1 + 0.15x_2 \geq 0.12(5,00,000)$

$\boxed{9x_1 + 15x_2 \geq 60,00,000}$

(∵ Return should be min 12% of $x_1 + x_2$)

(2).

$$0.5x_1 + 0.8x_2 \leq 0.6(5,00,000)$$

$$\boxed{5x_1 + 8x_2 \leq 30,00,000}$$

(∵ risk should be max of 6% of $(x_1 + x_2)$.

(3) Both are non negative constraint hence

$$\boxed{x_1 \geq 0 \quad \text{and} \quad x_2 \geq 0}$$

21.

Let x_1, x_2, x_3, x_4 be the product produced on X machine per week.

Let y_2, y_3, y_4 be the product produced on Y machine per week
(∵ product one is must on both machine X and Y)

Objective function :-

maximise P. =>
(Profit

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$$10x_1 + 12(x_2+y_2) + 17(x_3+y_3) + 8(x_4+y_4)$$

Constraints

① Floor space

$$0.1x_1 + 0.15(x_2+y_2) + 0.5(x_3+y_3) + 0.05(x_4+y_4) \leq 50$$

② Requirments

$$x_2+y_2 = 2(x_3+y_3)$$

③ available time

Machine X (100 - 5) = 95% available
Machine Y (100 - 7) = 93% available

Machine X

$$10x_1 + 12x_2 + 13x_3 + 8x_4 \leq 0.95(35)(60)$$

(∵ 35 hrs per week = (35)(60) min)

Machine Y

$$27x_1 + 19y_2 + 33y_3 + 23y_4 \leq 0.93(35)(60)$$

to product are non negative.

Hence

$$x_1 > 0$$
$$x_2, x_3, x_4 \geq 0$$
$$y_2, y_3, y_4 \geq 0$$