FY BBI   Q.P. code - 64244

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Solution - Paper code →

Q1 A Fill in the blanks Any 8 @ (1) mark each.

1) → C → H_0
2) → B → Zero or negative
3) → B → $x < y$
4) → d → Singular
5) → B → Systematic risk
6) → C → Lagging indicators
7) → A → optimal Solution.
8) → A → Type I error.
9) → B → capital
10) → A → Duplicate ratio

I B True or false @ (1) mark each Any 7.

1. True
2. False
3. True
4. True
5. False
6. True
7. False
8. False
9. True
10. False.

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2 A Graphical method. @ 8 marks

$5x_1 + 3x_2 = 30$ ($\geq$)

(6, 10)

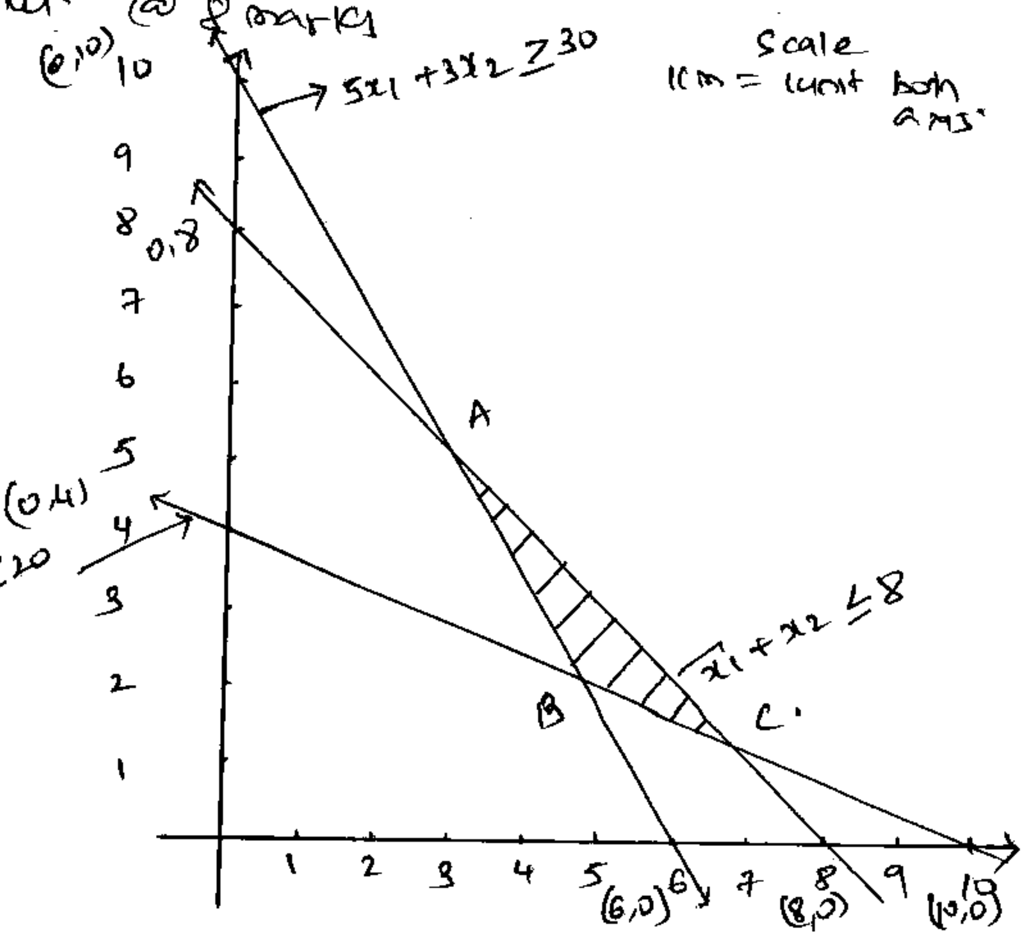
$2x_1 + 5x_2 = 20$ ($\geq$)

(10, 4)

$x_1 + x_2 = 8$ ($\leq$)

(8, 8)

Scale 1cm = 1unit both axes.



Objective function $\longrightarrow Z = 8x_1 + 5x_2$

$A \Rightarrow x_1 = 3 \quad x_2 = 5. \quad 8(3) + 5(5) = 49$

$B \rightarrow 2.105 \; (x_1) \quad 4.737 \; (x_2) \quad 8(2.105) + 5(4.737) = 40.525$

$C \rightarrow x_1 = 6.675 \quad x_2 = 1.33 \quad 8(6.675) + 5(1.33) = 60.05$

Maximum / optimal Profit = Rs 60.05

$\therefore x_1 = 6.675$ units $\quad x_2 = 1.33$ units.

Q2B @ 7 marks

Null hypothesis $H_0 = P = 0.5$

$H_1 = P < 0.5$ ($\because$ left tailed test)

$P = 0.5 \quad Q = 1 - 0.5 = 0.5$

Proportion of testing sample $\frac{70}{120} = 0.58 \; (P_1)$

$$Z = \frac{P_1 - P}{\sqrt{\frac{PQ}{n}}} \Rightarrow \frac{0.58 - 0.5}{\sqrt{\frac{0.5 \times 0.5}{120}}} = \frac{0.08}{0.046} = 1.74$$

$Z = 1.74$

For left tail test reject Null hypothesis

if $Z < (-) Z_\alpha$

$Z = 1.74 \quad 1.74 > -1.645$

$\therefore$ we accept Null hypothesis.

$\therefore$ Company's claim that 50 % consumers buy online is accepted or true.

Q I (A) Max $Z = 1000x_1 + 1800x_2$

Subj to constraints

$x_1 + x_2 \leq 10$

$1000x_1 + 800x_2 \leq 9000$

$x_1, x_2 \geq 0$

Constraints: $x_1 + x_2 + S_1 = 10$

$1000x_1 + 800x_2 + S_2 = ~~8~~\ 9000$

Since constraints are of $\leq$ type, adding slack variables.

Max: $Z = 2000x_1 + 1800x_2 + 0S_1 + 0S_2$:

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		CJ	2000	1800	0	0	
CB	B	XB	x_1	x_2	S_1	S_2	Rep. Ratio. XB / Key Col
0	S_1	10	1	1	1	0	10/1 = 10
0	S_2	9000	1000	800	0	1	9000/1000 = 9
		ZJ	0	0	0	0	
		CJ-ZJ	2000	1800	0	0	S_2 will be replaced by x_1.
2000	x_1	9	1	4/5	0	1/1000	45/4
0	S_1	1	0	1/5	1	-1/1000	5 Key to.
		ZJ	2000	1600	0	2	
		CJ-ZJ	0	200	0	-2	

S_1 will be replaced by x_2.

1800	x_2	~~45/4~~ 5	0	1	5	-1/200	
2000	x_1	5	1	0	-4	1/200	
		ZJ	2000	1800	1000	1	
		CJ-ZJ	0	0	-1000	-1	

All CJ (-) ZJ values of decision variables are 0 or -ve.

Maximization Problem is optimal

Solution:

Max Z = 2000 x_1 (+) 1800 x_2

2000 (5) + 1800 (5)

10,000 (+) 9000

= 19,000

Q2D

~~Q3~~ D LPP formulation → 5 marks

Objective function

Max $Z = 20x_1 + 30x_2$

Subject to constraints

Resources	x_1	x_2	Availability.
Z_1	12		5000
Z_2	16	10	9000
Z_3	—	30	12000

Constraints

$12x_1 \leq 5000$

$16x_1 + 10x_2 \leq 9000$

$30x_2 \leq 12000$

$x_1\ x_2 \geq 0.$

Q3 A Find inverse of $A = \begin{bmatrix} 8 & 4 & 2 \\ 2 & 9 & 4 \\ 1 & 2 & 8 \end{bmatrix}$

$|A| = 454$ since $|A| \neq 0$, A is a Non singular matrix. $\therefore A^{-1}$ can be calculated.

Cofactors.

$C_{11} = 64$ $\quad C_{21} = -28$ $\quad C_{31} = -2$

$C_{12} = -12$ $\quad C_{22} = 62$ $\quad C_{32} = -28$

$C_{13} = -5$ $\quad C_{23} = -12$ $\quad C_{33} = 64$

$$\therefore \text{Adj } A = \begin{bmatrix} 64 & -12 & -5 \\ -28 & 62 & -12 \\ -2 & -28 & 64 \end{bmatrix}^T = \begin{bmatrix} 64 & -28 & -2 \\ -12 & 62 & -28 \\ -5 & -12 & 64 \end{bmatrix}$$

$\therefore A^{-1} = \frac{1}{|A|} \times adj\, A$

$$A^{-1} = \frac{1}{454} \begin{bmatrix} 64 & -28 & -2 \\ -12 & 62 & -28 \\ -5 & -12 & 64 \end{bmatrix}$$

Q3 B Original Price Rs 7000/- — @7 with workings.

If 30% discount is to be given

$7000 - 2100 = Rs\ 4900$.

OR.

Q3 C. $2X + A - 2B = 0$

$\therefore 2X = 2B - A$.

$$2X = 2\begin{bmatrix} 1 & -2 & 3 \\ 2 & 4 & 5 \end{bmatrix} (-) \begin{bmatrix} 2 & 4 & 3 \\ -3 & -1 & 0 \end{bmatrix}$$

$$2X = \begin{bmatrix} 2 & -4 & 6 \\ 4 & 8 & 10 \end{bmatrix} (-) \begin{bmatrix} 2 & 4 & 3 \\ -3 & -1 & 0 \end{bmatrix}$$

$$2X = \begin{bmatrix} 0 & -8 & 3 \\ 7 & 9 & 10 \end{bmatrix} \quad \therefore X = \begin{bmatrix} 0 & -4 & 3/2 \\ 7/2 & 9/2 & 5 \end{bmatrix}$$

(4 marks)

$$A^T = \begin{bmatrix} 2 & -3 \\ 4 & -1 \\ 3 & 0 \end{bmatrix} \quad B^T = \begin{bmatrix} 1 & 2 \\ -2 & 4 \\ 3 & 5 \end{bmatrix}$$

$$A^T + B^T = \begin{bmatrix} 3 & -1 \\ 2 & +3 \\ 6 & 5 \end{bmatrix}$$

$$(A+B) \Rightarrow \begin{bmatrix} 3 & 2 & 6 \\ -1 & 3 & 5 \end{bmatrix} \quad \therefore (A+B)^T = \begin{bmatrix} 3 & -1 \\ 2 & 3 \\ 6 & 5 \end{bmatrix}$$

$\therefore A^T + B^T = (A+B)^T$

4 marks

Q3 D. Price (P) $\propto \frac{1}{\text{Number (N)}}$ @ 7marks

$\therefore P = \frac{K}{N}$ $400 = \frac{K}{10}$ $\therefore$ $K = 4000$

$P = \frac{K}{N}$ find P if N = 50

$\therefore P = \frac{4000}{50} = 80$

Q4 A Expected Return Sec X @ 8 mks

$(-10 \times 0.1) + (15 \times 0.3) + (18 \times 0.3) + (22 \times 0.2) + (27 \times 0.1)$

$-1 + 4.5 + 5.4 + 4.4 + 2.7 = 16\%$.

Expected return Security Y

$(5 \times 0.1) + (12 \times 0.3) + (19 \times 0.3) + (15 \times 0.2) + (12 \times 0.1)$

$0.5 + 3.6 + 5.7 + 3 + 1.2 = 14\%$

State of nature	Probability ★	R(A)	E(R) A	Deviation (A) ★	R(B)	E(R) B	Deviation (B) ★	Prob x dev x dev.
1	0.1	-10	16	-26	5	14	-9	23.4
2	0.3	15	16	-1	12	14	-2	0.6
3	0.3	18	16	2	19	14	5	3
4	0.2	22	16	6	15	14	1	1.2
5	0.1	27	16	11	12	14	-2	(-) 2.2
								26

Cov = $\sum$ Probability x deviation of sec x x deviation of sec y.

Cov = 26

Positive covariance. Returns of both stocks move in same direction.

9 4B Beta Calculation.

$$\beta = \frac{\sum (R_i - \bar{R_i})(R_m - \bar{R_m})}{\sum (R_m - \bar{R_m})^2}$$

@ 2 marks

Avg return on Security Z $(\bar{R_i}) = \frac{112}{8} = 14\%$.

Avg mkt return $= \frac{144}{8} = 18\%$.

Yr	R_i	$(R_i - \bar{R_i})$	R_m	$(R_m - \bar{R_m})$	$(R_i - \bar{R_i})(R_m - \bar{R_m})$	$(R_m - \bar{R_m})^2$
1	12	−2	20	2	−4	4
2	15	1	16	−2	−2	4
3	16	2	18	0	0	0
4	14	0	19	1	1	1
5	12	−2	17	−1	2	1
6	15	1	20	2	2	4
7	13	−1	16	−2	2	4
8	15	1	18	0	0	0
					+1	18

$$\beta = \frac{\sum (R_i - \bar{R_i})(R_m - \bar{R_m})}{(R_m - \bar{R_m})^2} = \frac{1}{18} = 0.056$$

Beta is less than 1

∴ Security is less risky than market portfolio.

Total

Q4C

10 marks → 5 mks for each company.

Security ABC ltd

$E(R) = (12 \times 0.1) + (14 \times 0.25) + (16 \times 0.3) + (18 \times 0.25) + (20 \times 0.10)$

$1.2 + 3.5 + 4.8 + 4.5 + 2$

$E(R) = 16\%$

State	Returns	$(x - \bar{x})$	$(x - \bar{x})^2$	Probability	Variance $P(x - \bar{x})^2$
1	12	−4	16	0.1	1.6
2	14	−2	4	0.25	1
3	16	0	0	0.3	0
4	18	2	4	0.25	1
5	20	4	16 →	0.1	1.6
					5.2

Variance = 5.2

Std deviation = 2.28

Security XYZ

$E(R) = (8 \times 0.1) + (12 \times 0.2) + (16 \times 0.4) + (20 \times 0.2) + (24 \times 0.1)$

$= 0.8 + 2.4 + 6.4 + 4 + 2.4$

$E(R) = 16\%$

State	Returns	$(y - \bar{y})$	$(y - \bar{y})^2$	Probability	Variance $P(y - \bar{y})^2$
1	8	−8	64	0.1	6.4
2	12	−4	16	0.2	3.2
3	16	0	0	0.4	0
4	20	4	16	0.2	3.2
5	24	8	64	0.1	6.4
					19.2

Variance = 19.2

Std dev = 4.38

	Exp Returns.	Std deviation.	
ABC	16%	2.28	Select ABC.
XYZ	16%	4.38	

4D E(R)

(6 × 0.2) + (12 × 0.5) + (20 × 0.3)

= 1.2 + 6 + 6 = 13.2% → E(R)

5 marks

Q5 → Theory Answer

End of Solution.