

- Instruction :**
- 1) All questions are compulsory.
 - 2) Each question carries equal marks.
 - 3) Only simple calculators are allowed.
 - 4) Figures to the right indicate full marks.

- Q.1 a) Define :**
- i) Contribution 4
 - ii) Break-even point

- b)** A simple random sample of size 70 was drawn in the process of estimating the average annual income of families of a certain locality. The mean and the standard deviation of the sample was found to be Rs. 15,250 and Rs. 1300 respectively. Carry out testing of hypothesis to test the claim that average family income is Rs. 16000. (consider 5% level of significance)
(standard Normal Table value at 5% I.o.s. is 1.96) 5

- c)** A company produces two products A & B. Both products are processed on three machines M, N & P. The time required in hours to produce 1 unit of each product on each of the machines is given alongwith the total available time for each machine in the following table.

Machine	Time required / Unit of		Total available Time
	A	B	
M	3	3	36
N	4	2	40
P	2	6	60

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Profits are Rs. 75 per unit of A & Rs. 200 per unit of B formulate & solve graphically the L.P.P. to maximize profit.

OR

- Q.1 a) Explain with examples. :** 4
- i) Systematic sampling
 - ii) Stratified sampling

- b)** A company claimed that average weight of their product is 22 kg. A sample of 80 products was collected and sample mean was found to be 17.5 kg. with standard deviation of 5.6 k.g. Test the company's claim at 5% level of significance .
(Standard Normal Table Value at 5% I.o.s. is 1.96) 5

- c) Solve graphically 6
- Minimize $Z = 4x_1 + 5x_2$
- Subject to $x_1 + x_2 \geq 6$
- $5x_1 + x_2 \geq 10$
- $x_1 + 4x_2 \geq 12, \quad x_1 \geq 0, \quad x_2 \geq 0.$
- Q.2** a) i) Give definition of general L.P.P. 4
- ii) Define simple interest.
- b) Use graphical method to solve the L.P.P. 6
- Maximize $Z = 50x_1 + 100x_2$
- Subject to $5x_1 + 4x_2 \leq 60$
- $5x_1 + 3x_2 \leq 50$
- $x_1 \geq 0, \quad x_2 \geq 0.$
- c) Define factor reversal test. 5
- Check whether fisher's index satisfies the factor reversal test.
- OR**
- Q.2** a) Write the following L.P.P. in standard format
- i) A toy manufacturer produces scooters & bicycles, each of which must be processed through two machines A & B. Machine A has a maximum 120 hrs available & machine B has a maximum of 180 hrs available. Manufacturing a scooter requires 4 hrs on machine A & 10 hrs on machine B. Manufacturing a bicycle requires 6 hrs on machine A & 3 hrs on machine B. If profits are Rs. 700 for a bicycle & Rs. 800 for a scooter, formulate the L.P.P. to maximize the profit. 4
- ii) A manufacturer has to decide on the quantities of products P & Q. At least 50 units of P must be produced per week. The market can not absorb more than 60 units of Q per week. The machine time required is 4 hrs per unit of P & 5 hrs per unit of Q. In all, 500 hrs of the machine are available per week as there are 10 machines working each for 50 hrs per week. Formulate the L.P.P. to maximize profit, if the profit per unit is Rs. 100 for P & Rs.120 for Q. 4
- b) Solve following L.P.P. graphically 7
- Maximize $Z = 2x + y$
- Subject to $x + y \geq 5$
- $2x + 3y \leq 21$
- $4x + 3y \leq 24$
- $x, y \geq 0$

- Q.3 a)** Calculate Marshall-Edgeworth's & Fisher's price index numbers for 1977 from the following data taking 1970 as base. 7

Commodity	Price in		Quantity in	
	1970	1977	1970	1977
Wheat	6.4	3.7	11	10
Jawar	5.1	2.7	5	3
Rice	9.3	4.5	100	90

- b)** What is discounting factor ? 4

A person has invested Rs. 45,000 in a bank deposit scheme for 6 years at 8% rate of interest. What is the future value of this amount ?

c) If $A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 2 & 0 \\ -2 & 7 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & -2 & 7 \\ 8 & 0 & 9 \\ 3 & 1 & -5 \end{bmatrix}$ 4

Find the matrix X st $2A + 3X = 5B$.

OR

- Q.3 a)** ABC trading company has the following information during two time periods as- 6

	Period I	Period II
Sales	18,00,000	27,00,000
Profit	9,00,000	13,00,000

- Find (i) Profit volume ratio (ii) Contribution
(iii) Break-even point for period II.

b) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$, $B = \begin{bmatrix} -1 & -2 \\ 0 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 0 & 6 \\ 8 & 7 \end{bmatrix}$ 5

Verify that $(A \times B) \times C = A \times (B \times C)$

- c)** A shipping company has following investment structure with corresponding probabilities. 4

Return on investments	0.48	0.59	-0.21	-0.37	0.60	0.70	0.83
Probability	0.06	0.08	0.5	0.3	0.04	0.01	0.01

Q.4 a) Find the values of a & b such that

$$\text{If } a \begin{bmatrix} 1 & -1 \\ 1 & -2 \\ 2 & -3 \end{bmatrix} - b \begin{bmatrix} -2 & 2 \\ -3 & 3 \\ -4 & 3 \end{bmatrix} = \begin{bmatrix} -1 & 1 \\ -3 & 0 \\ -2 & 3 \end{bmatrix} \quad 5$$

OR

b) Show that Fisher Index No. satisfies both time reversal test & Factor reversal test. 4

c) Give below are likely returns in case of shares of PQR Ltd. and ABC Ltd. in the varies economic conditions. Both the shares are presently quoted as Rx. 100 per share.

Economic condition	Probability	Returns on PQR Ltd.	Returns on ABC Ltd.
High Growth	0.06	400	290
Low Growth	0.65	550	350
Stagnation	0.09	620	190
Recession	0.20	240	250

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which of the two shares is risky investment ?

OR

Q.4 a) A company has to select one of the following two projects with investment of Rs. 20,000.

	Project A	Project B
Cash inflows		
1 st year	8,000	5,000
2 nd year	10,000	6,500
3 rd year	25,000	12,000
4 th year	15,000	16,000
5 th year	20,000	10,000

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Which is best investment of the company if discounting factor is 6% ?

b) Calculate i) Simple interest & ii) compound interest if amount of Rs. 20,000 is invested for 12 years with 8% rate of interest. What are accumulated values ? 5

c) What is future value of annuity ?
Eight equal payments of Rs. 8000 are made into a deposit account that gives 5% rate of interest per year. What is the future value of annuity at the end of eight years ? 4
