[This question paper contains 6 printed pages.]

2039   *Your Roll No.* ....

B.Sc. (Hons.) / III   **E**

STATISTICS – Paper XXIII

,   (Operational Research)

(Admissions of 1999 and onwards)

Time : 2 Hours   *Maximum Marks : 38*

(Write your Roll No. on the top immediately
on receipt of this question paper.)

Attempt any **FOUR** *questions*
selecting **TWO** *from each Section.*
Use of simple calculator is allowed.

SECTION I

1.   (a) Solve the following L.P.P. :

Max. $Z = 8x_2$

subject to constraints

$x_1 - x_2 \geq 0,$

$2x_1 + 3x_2 \leq -6,$

x_1, x_2 are unrestricted.

                                                    P.T.O.

(b) Solve the following L.P.P. using principle of duality.

Max. $Z = 6x_1 + 8x_2$,

subject to constraints

$30x_1 + 20x_2 \leq 300$,

$5x_1 + 10x_2 \leq 110$,

$x_1, x_2 \geq 0$.   (4½,5)

2. (a) Solve the following N.L.P.P.

Min $Z = 2x_1 + 3x_2 - x_1^2 - 2x_2^2$

subject to the constraints

$x_1 + 3x_2 \leq 6$,

$5x_1 + 2x_2 \leq 10$,

$x_1, x_2 \geq 0$.

(b) The demand for a particular item is 18,000 units per year. The holding cost per unit is ₹ 1.20 per year and the cost of procurement is ₹ 400/-. Shortages are not allowed and the replacement rate is instantaneous. Determine :

(i) Optimum order quantity
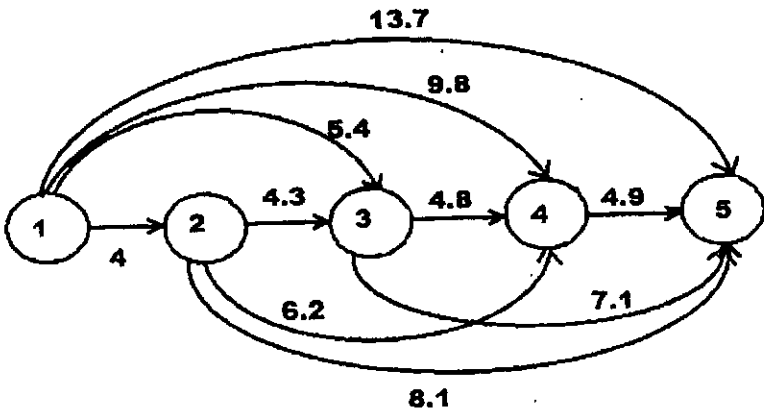
(ii) Number of orders per year

(iii) Time between orders and

(iv) Total cost per year when the cost of one unit

is ₹ 1/-.   (4½,5)

3.   (a) Solve the following assignment problem :

Man

		1	2	3	4
	I	18	30	21	15
Work	II	18	33	9	31
	III	44	25	24	21
	IV	23	30	28	14

(b) Compute the shortest distance from node 1 to
node 5 :   (4½,5)

SECTION II

4. (a) A confectioner sells confectionery items. Past data of demand per week (in hundred Kg.) with frequency is given below :

Demand/Week	0	5	10	15	20	25
Frequency	2	11	8	21	5	3

Using the following sequence of random numbers, generate the demand for the next 10 weeks.

35 52 90 13 23 73 34 57 35 83 94 56 67 66 60.

Also find the average demand per week.

(b) A company is spending ₹ 1000/- on transportation of its units from three plants to four distribution centres. The supply and demand of units, with unit cost of transportation are given below :

		Distribution Centre				Availability
		D_1	D_2	D_3	D_4	
	P1	19	30	50	12	7
Plant	P2	70	30	40	60	10
	P3	40	10	60	20	18
Requirement		5	8	7	15	

What can be the maximum saving by optimal scheduling ? (4½,5)

5. (a) Solve the game graphically whose pay off matrix is given below :

B

		I	II
A	I	2	4
	II	2	3
	III	3	2
	IV	-2	6

(b) A bulb manufacturing company has a contract to supply 5000 bulbs to an automobile factory per day. The company has capacity to manufacture 8,000 bulbs and holding cost of 1000 bulbs is 8 paise. Set up cost is ₹ 20. What would be the frequency of production run ? (4½,5)

6. Write short notes on the following :

(i) Inventory control models

(ii) Quadratic Programming

(iii) Concept of duality   (3,3,3½)