Instructions :
1. All questions are compulsory.
2. Figures to the right indicate marks.
3. Graph papers, statistical tables will be provided on request.

Q.1 a. In a population of 4 units, with values 2,3,3,4, write down all possible simple random samples of size 3 without replacement. (4)

Verify (i) $E(\bar{y}) = \bar{Y}$

(ii) $V(\bar{y}) = \dfrac{N-n}{Nn} S^2$

b. Fit a straight line $y = a + bx$ to the following data - (2)

Year (x)	:	1971	1972	1973	1974	1975
Production (y)	:	210	224	250	280	310

c. Present the following activities in form of network and determine - (4)
i. Critical Path
ii. Earliest an latest expected time
iii. Probability of completing the project within scheduled completion of 48 days.

Activity	Optimistic (t_0)	Most likely(t_m)	Pessimistic (t_p)
1 - 2	4	8	12
2- 3	1	4	7
2 - 4	8	12	16
3 - 5	3	5	7
4 - 5	0	0	0
4 - 6	3	6	9
5 - 7	3	6	9
5 - 8	4	6	8
7 - 9	4	8	12
8 - 9	2	5	8
9 - 10	4	10	16
6 - 10	4	6	8

OR

Q.1 p. A school consist of 10,000 children. Using the following radom No. draw a random sample of size 24, given that the children have 1 to 1200 as their roll number. (3)

24	12	24	65	91	27	69	90	64	94
04	84	54	66	72	61	19	63	02	31
92	96	26	17	73	41	33	95	53	82
30	53	22	17	04	10	27	41	22	02
39	60	52	33	09	03	78	89	75	99
75	86	72	07	17	74	31	65	31	66
43	22	16	33	79	85	78	34	06	29
53	15	26	74	33					

Use SRSWOR

q) Fit a curve of the type $y = a \cdot x^b$ to the following data. (3)

x : 1   2   3   4

y : 0.7   0.86 0.97 1.06

r) The following table gives the activities in a construction project and other relevant information -

Activity : 1 - 2   1 - 3   2 - 3   2 - 4   3 - 4   4 - 5

Duration : 20   25   10   12   6   10

i.   Draw the network for the project
ii. Find critical path
iii. Find free, total and independent floats for each activity. (4)

Q.2 a. A company has factory at F_1, F_2 and F_3 which supply to warehouse W_1, W_2 and W_3. Weekly factory capacities are 200, 216 and 90 units respectively. weekly warehouse requirements are 180, 120 and 150 units respectively. Unit shipping cost (in Rs.) are as follows -

Warehouse

Factory	W_1	W_2	W_3	Supply
F1	16	20	12	200
F2	14	8	18	160
F3	26	24	16	90
Demand	180	120	150	

Determine the optimal solution for this company to minimize total Shipping cost. (3)

b. Use simplex method to solve following LPP

Max. $Z = x_1 + x_2 + x_3$

subject to,

$$3x_1 + 2x_2 + 3x_3 \leq 3$$
$$2x_1 + x_2 + 2x_3 \leq 2$$
$$x_1, x_2, 3x_3 \geq 0$$

(4)

c. The following data represent the last digits of the cars passing at a certain traffic signal observed during last 30 minutes for 180 cars.

Last digit : 0   1   2   3   4   5   6   7   8   9

Frequency : 12 20 14 12 21 18 17 26 19 21

Can we retain at 5% level of significance that all the digits are equally likely to occur ? (3)

q) Fit a curve of the type $y = a \cdot x^b$ to the following data. (3)

x	:	1	2	3	4
y	:	0.7	0.86	0.97	1.06

r) The following table gives the activities in a construction project and other relevant information -

Activity	:	1 - 2	1 - 3	2 - 3	2 - 4	3 - 4	4 - 5
Duration	:	20	25	10	12	6	10

i. Draw the network for the project
ii. Find critical path
iii. Find free, total and independent floats for each activity. (4)

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Last digit	:	0	1	2	3	4	5	6	7	8	9
Frequency	:	12	20	14	12	21	18	17	26	19	21

Can we retain at 5% level of significance that all the digits are equally likely to occur? (3)