

T. Y. B. Sc. March-April 2017
Statistics Paper - 304

Marks : 75

Time : 3 Hours

- Instructions:-** 1) There are five compulsory questions in this Q. Paper.
2) All question carry equal marks.
3) Statistical Tables will be provided on request.

- Q1 a) Describe the construction and uses of control charts for mean and range. 6
b) Give distinguish between - Process control and Product control. 3
c) Ten samples each of 100 items are drawn from a production process. 6
The number of defective items in the samples is respectively 12, 10, 0, 15, 5, 7, 6, 10, 9, and 11. Draw an appropriate chart and give your conclusion.

OR

- Q1 a) Explain the construction of 3- σ control limits for the control charts for 'Fraction Defective'. 7
b) A control chart for \bar{X} and R are maintained on dissolved iron content of a certain solution in parts per million (ppm). After 2.5 hourly samples have been drawn and analyzed, the data organized into 25 sub-groups of 5 measurements each maintaining the time order of sampling. from these data: $\Sigma X = 390.8$ and $\Sigma R = 84$ 8
i) Construct 3 - σ control limit for \bar{X} and R- chart. Estimate process s.d.
ii) The specification on this process calls for a number more than 18 ppm dissolved iron solution. Assuming a normal distribution underlies the process and that the process continues to be in statistical control with no change in average or dispersion, what proportion of sample measurements may be expected to exceed this specification?
- Q2 a) Explain the following terms 8
i) A.Q.L, ii A.O.Q, iii) L.T.P.D iv) A.T.I.
b) For each sampling plan given below:- 7
Plan A:- $n = 150, C = 1$
Plan B:- $n = 300, C = 2$
Determine , i) Consumer risk for limiting quality of 4%
ii) Producer's risk for AQL 1%
iii) Which of the two plan would you prefer, if you were
a) consumer and b) producer.
- Q2 a) Describe the Role of 'OC curve' of acceptance sampling plan. 4
b) For a SSP (1200, 100, 2), Using Poisson probability distribution, if 6
AQL and LTPD are 0.05 and 0.1 respectively, find Producer's Risk and Consumer's Risk.
c) Explain the scheme of acceptance sampling in double sampling plan. 5
- Q3 a) Define the following terms, 6
i) Feasible Solution, ii) Basic feasible Solution, iii) Optimal Solution.

- b) A person requires 10, 12 and 12 units of chemical A, B and C respectively for his garden. A liquid product contains 5, 2 and 1 units of A, B and C respectively per jar. A dry product contains 1, 2 and 4 units of A, B and C respectively. If the liquid product sells for Rs. 3/- per jar and dry product for Rs. 2/- per carton, how many of each should be purchased in order to minimize the cost & meet the requirements?

c) Give the difference between primal L.P.P. and dual L. P. P.. 4

OR

Q3 a) What is Linear Programming Programme. Give its general formulation. Why it is called L.P.P.? 6

b) Write down the dual of the LPP. Hence solve it. 4

$$\text{Min. } Z = 20x_1 + 10x_2$$

$$\text{Subject to: } 36x_1 + 6x_2 \geq 108$$

$$3x_1 + 12x_2 \geq 36$$

$$20x_1 + 10x_2 \geq 100. \quad x_1, x_2 \geq 0$$

c) Prove that, 'set of feasible solution is a convex set'. 5

Q4 a) What is the problem of Assignment? Give its mathematical formulation. Show that it is a special case of TP. 7

b) A company manufacturing air-coolers has two plants located at Bombay and Kolkota with a capacity of 200 units and 100 units per weeks respectively. The company supply air coolers to its four showrooms situated in Ranchi, Delhi, Lucknow and Kanpur, which have maximum demand of 75, 100, 100 and 30 units respectively. Due to the differences in raw material cost and transportation cost, the profit per unit in rupees differs which is shown in the table below:

Plants \ Showrooms →	Ranchi	Delhi	Lucknow	Kanpur
Bombay	90	90	100	100
Kolkota	50	70	130	85

Plan the production schedule so as to maximize the profit. What is the maximum profit?

OR

Q4 a) What is the problem of Transportation? Give its mathematical formulation. 4

b) Explain the 'Vogal's approximation Method' of solving a Transportation Problem.. 4

c) Solve the following minimization type assignment problem, 7

	D ₁	D ₂	D ₃	D ₄	D ₅
O ₁	3	5	4	6	5
O ₂	8	5	7	9	5
O ₃	3	10	9	11	5
O ₄	9	7	13	8	5
O ₅	3	9	6	9	9

- Q5 a) Explain the following terms in network analysis: 6
- i) Activity
 - ii) Events
 - iii) Critical Path of a project.
- b) Stating various assumptions, describe the Johnson's method of solving n- jobs through 2- machines sequencing problem. 4
- c) Seven jobs are to be processed through two machines A and B. 5
Processing times
(in hours) are given below:

Jobs	1	2	3	4	5	6	7
Machine A	10	9	7	15	18	20	14
Machine B	12	8	7	12	10	6	13

Determine the optimum sequence for the jobs, total elapsed time and idle time on each machine.

OR

- Q5 a) Differentiate CPM and PERT. 5
- b) State rules of network construction. 4
- c) Given the precedence relationships among various activities of the following project: 6

Activity	Preceding Activity	Time Estimates (in Week)		
		t_m	t_o	t_p
A	-	2	4	14
B	-	10	12	26
C	A	8	9	10
D	A	10	15	20
E	A	7	7.5	11
F	B,C	9	9	9
G	D	3	3.5	7
H	E,F,G	5	5	5

- I. Draw the PERT network for the project.
- II. Determine the Critical Path, Expected Length of Project.
- III. If a 30 week deadline is imposed, what is probability that the project will be finished within time limit?