NRT/KS/19/5932

Bachelor of Arts (B.A.) Fifth Semester Examination

STATISTICS

(Statistical Quality Control and Linear Programming Problem)

Optional Paper—1

Time : Three Hours] [Maximum Marks : 50

Note :— All questions are compulsory and carry equal marks.

1. (A) What is Statistical Quality Control ? Explain the construction of control chart for $\bar{x}$ and σ when :

   (i) Standards are given

   (ii) Standards are not given. 10

OR

(E) Explain the theoretical basis of Control Charts. Discuss the construction of p and np-chart. 10

2. (A) Explain the purpose of sampling inspection plan. Describe single sampling plan, explaining :

   (i) Lot Quality Protection

   (ii) Average Outgoing Quality Protection Approach. 10

OR

(E) Describe double sampling plan and obtain expression for producer's risk. Explain the advantage of using double sampling plan over single sampling plan. 10

3. (A) Describe the graphical method of solving an LPP.

   (B) State Standard Linear Programming Problem.

   Define :

   (i) Basic solution

   (ii) Basic feasible solution

   (iii) Degenerate basic feasible solution. 5+5

OR

(E) Define : Hyperplane, convex set and extreme point of a convex set. Prove that any point on the line segment joining two points in E_n, can be expressed as a convex combination of the two points. 10

4. (A) In a Standard LPP with given basic feasible solution, state the condition for which it is possible to improve the value of objective function. Also obtain for this condition the improved basic feasible solution. Obtain the margin by which the value of objective function will change. 10

OR

(E) Write Simplex Algorithm.

(F) In usual notation, show that, if for any extreme point basic feasible solution to an LPP, $(Z_j - C_j) \leq 0$ for every column vector Pj not in the basis then that basic feasible solution is the minimum feasible solution. 5+5

5. Solve any **TEN** of the following :

(a) Define 'Natural Tolerance Limits'.

(b) State control limits of R-Chart when standards are given.

(c) Explain the concept of 'Rational Subgroup' in SQL.

(d) Define : ASN and ATI.

(e) State how CSP-I is modified in CSP-II.

(f) Define O.C. Curve.

(g) Define slack and surplus variables in an LPP.

(h) In usual notation, show that :

$$\max [f(x)] = - \min (-f(x))$$

(i) Show that intersection of two convex sets is a convex set.

(j) State the need of artificial variable in Simplex Method.

(k) State the condition for an unbounded solution to an LPP while solving it using Simplex Method.

(l) State the condition for degeneracy in Simplex Method. $1 \times 10 = 10$