Bachelor of Science (B.Sc.) Semester–V (C.B.S.) Examination

STATISTICS

(Statistical Quality Control and Linear Programming Problem)

Compulsory Paper—1

Time : Three Hours]   [Maximum Marks : 50

N.B. :— ALL questions are compulsory and carry equal marks.

1.   (A) What is Statistical Quality Control ? Explain the construction of control charts for $\overline{X}$ and σ for both cases : standards given and standards not given.   10

OR

(E) Explain the basis for the 3σ- control limits when the characteristics can be considered to be random variable that :

(a) follows normal distribution.

(b) does not follow normal distribution.

Explain assignable and chance causes of variation. What are rational subgroups ?   10

2.   (A) Describe the steps of double sampling plan and derive its O.C., AOQ and ASN.   10

OR

(E) Define : (i) Producer's risk and consumer's risk.

(ii) AQL and LTPD.

Also derive their expression in case of Single Sampling Plan.   10

3.   (A) Define a convex set. Prove that the set of all feasible solutions to an LPP is a convex set. Further show that the objective function attains its optimum value at an extreme point of this set. Also show that if it assumes its optimum value at more than one extreme points then it takes on the same value for every convex combination of these extreme points.   10

OR

(E) Define : Hyperplane, convex set and an extreme point of a convex set.

Prove that any point on the line segment joining two points in En. can be expressed as a convex combination of the two points. Also prove its converse. 10

4. (A) In usual notation, show that if for a basic feasible solution to an LPP, $(Z_j - C_j) \le 0$ for every column vector P_j not in the basis, then that basic feasible solution is the minimum feasible solution.

(B) State 'Simplex Algorithm'. 5+5=10

OR

(E) Explain the procedure of generating an extreme point solution from a given extreme point solution in terms of m linearly independent vectors of the problem matrix. 10

5. Solve any **ten** of the following :–

(a) Fill in the blanks :

The tools for product control are called _____ and the tools for process control are called _____.

(b) Define Natural Tolerance limits.

(c) State the control limits of R-chart when standards are not given.

(d) Define O.C. curve.

(e) Describe, how CSP-I is modified as CSP-II.

(f) Define : (i) ASN

(ii) ATI.

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

(h) Define slack and surplus variables.

(i) State true or false :

(i) If all the constraints of an LPP are greater than or equal to type, the LPP can not have a feasible solution.

(ii) The optimum solution of an LPP is always unique.

(j) Distinguish between simplex method and condensed simplex method.

(k) State the condition for degeneracy while using simplex method.

(l) State the condition for 'No feasible Solution' to an LPP. 1×10=10