KNT/KW/16/5184

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

STATISTICS

Compulsory Paper—1

(Statistical Quality Control and Linear Programming Problem)

Time : Three Hours] [Maximum Marks : 50

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

1. (A) Derive the control limits of $\overline{X}$ and R-chart when the :

   (i) Standards are known

   (ii) Standards are unknown.

   Also explain the procedure of detecting lack of control. 10

OR

(E) Distinguish between the 'process control' and the 'product control'. State the technique used for 'process control'. Derive the control limits for control chart for number of defectives. 10

2. (A) Describe single sampling plan and Derive the expression for the following :

   (i) Probability of acceptance

   (ii) Producer's risk

   (iii) ATI. 10

OR

(E) Explain double sampling plan and obtain expression for consumer's risk. Also compare double sampling plan with single sampling plan. 10

3. (A) If $X = (x_1, x_2, \text{-------} x_n)$ is an extreme point of the convex polyhedron formed by the set of all feasible solutions of an LPP, then show that the vectors associated with positive x_i's form a linearly independent set. Also show that atmost m of the x_i's are positive for the problem with m constraints. 10

OR

(E) Define standard linear programming problem and General linear programming problem.

A company produces two types of hats and sells them at a profit of Rs. 2 on type-I and Rs. 3 on type-II. Each hat is processed on two machines G and H. Type-I requires one minute of processing time on G and two minutes on H. Type-II requires one minute of G and one minute on H. The machine G is available for not more than 400 minutes while machine H is available for 600 minutes. Formulate the problem as a linear programming problem.

Explain graphical method of solving an LPP. 10

4. (A) In usual notation for a standard minimization problem if, for any fixed j, the condition $Zj–Cj > 0$ holds, then a set of feasible solutions can be constructed such that $Z < Z_0$ for any member of the set, where the lower bound of Z is either finite or infinite. 10

OR

(E) Define Artificial variables. Describe 'Big-M' method of solving an LPP. When does an LPP have :

(1) No feasible solution

(2) Multiple optimum solution

(3) An unbounded solution. 10

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

(A) What are chance causes of variation ?

(B) Distinguish between 'Natural Tolerance Limits' and 'Specification Limits'.

(C) State various applications of 'C' Chart.

(D) Who designed CSP and what does it stand for ?

(E) Define : Consumer's risk.

(F) Define : ASN.

(G) Define slack and surplus variables in LPP.

(H) In usual notation, prove that :

$\max [f(x)] = – \min[–f(x)]$

(I) Define :

(i) Basic feasible solution

(ii) Non-degenerate basic feasible solution.

(J) What is condensed simplex method of solving an LPP ?

(K) State true or false :

(i) In a simplex method, the pivot element can be zero or negative.

(ii) Constraints involving equal to sign always require use of artificial variable

(L) In usual notation, prove that the net evaluations $(Zj – Cj)$ are zero corresponding to the vectors in the basis. 1×10=10