# Fifth Semester B. Sc. Examination

## STATISTICS

### Paper – I

**(Statistical Quality Control and Linear Programming Problem)**

Time : Three Hours ]                    [ Max. Marks : 50

N. B. : All questions are compulsory and carry equal marks.

1. (A) Explain the underlying principle of Statistical Quality Control. Describe the control charts for mean quality. 10

**OR**

(E) Distinguish between 'Process Control" and "Product Control." Describe the control charts for number of defectives and fraction defectives when the standards are not given.
   If the sample size is variable then which chart is appropriate ? 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 consumer's risk. Explain the advantage of using double sampling plan over single sampling plan. 10

3. (A) Define : Hyperplane, convex set and extreme point of a convex set. Prove that the set of feasible solutions to an L.P.P. is a convex set. 10

**OR**

(E) Define standard linear programming problem and General linear programming problem. The standard weight of a special brick is 5 kg and it contains two ingredients $B_1$ and $B_2$. $B_1$ costs Rs. 5 per kg and $B_2$ costs Rs. 8 per kg. Strength considerations dictate that the brick contains not more than 4 Kg of $B_1$ and a minimum of 2 Kg of $B_2$ since the demand for the product is likely to be related to the price of the brick. Formulate the above problem as a LPP. Explain Graphical method of solving an LPP. Also state its limitation. 10

4. (A) Define Artificial variables.

   Describe 'Big-M' method of solving an L.P.P. 10

**OR**

(E) Describe 'Simplex Algorithm.' 5

(F) Explain the cases when an LPP has (i) optimum solution, (ii) unbounded solution and (iii) no feasible solution, Using simplex method.    5

5. Solve any **Ten** of the following :-

   (a) Distinguish between 'Natural Tolerance Limits' and 'specification limits.'

   (b) Explain the use of 'R-Chart.'

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

   (d) Describe CSP-I.

   (e) Define : Producer's and Consumer's Risks.

   (f) Define : ASN and ATI.

   (g) Define slack and surplus variables in LPP.

   (h) In usual notation, prove that
       $\max [f(X)] = -\min[-f(x)]$

   (i) State the condition for infinitely many optimum solutions to an LPP.

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

   (k) Explain how to detect degeneracy using simplex method.

   (l) In usual notation, Prove that the net evaluations $(z_j - c_j)$ corresponding to the vectors in the basis are zero.    $1 \times 10 = 10$