Exam.Code:0006
Sub. Code: 0539

2071

B.A./B.Sc. (General) Sixth Semester

Statistics

Paper-303: Statistical Quality Control and Computational Techniques

Time allowed: 3 Hours

Max. Marks: 65

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit. Use of electronic calculator with four basic mathematical operations and upto one memory is allowed. Statistical tables and log tables will be provided on request.*

x-x-x

1. (a) What is the difference between Assignable and Chance variations. Explain giving suitable exapmles.
   (b) What is the ideal shape of the O.C curve ?
   (c) DefineLagrange's interpolation method.
   (d) What is the role of artifical variables? Give example .
   (e) What is a feasible solution? How is it different from basic feasible solution?
   (f) Define terms: Natural Tolerance Limits, Control limits and Specification Limits. (2× 5)

Unit –I

2. Discuss the logic underlying the use of 3σ limits on Shewhart control charts. Hence give the $\bar{X}$ Shewart control chart. What is the role of revised control limits? Explain in the context of $\bar{X}$ chart. (13)

3. (a) Distinguish between control chart for attributes and control chart for variables. Explain in detail the control chart for fraction defectives. (3 Marks)

   (b) The following data represent the number of nonconformities (defects) per 1000 meters in telephone cable.

Sample number	Number of nonconformities	Sample number	Number of nonconformities
1	1	12	6
2	1	13	9
3	3	14	11
4	7	15	15
5	8	16	8
6	10	17	3
7	5	18	6
8	13	19	7
9	0	20	4
10	19	21	9
11	24	22	20

P.T.O.

Draw suitable control chart. From analysis of this data, would you conclude that the process is in statistical control? (7.6)

4. What is single Sampling plan? Explain giving flow diagram. and obtain the expression for its O.C function and its ATI curve. How to obtain the AOQL curve of single sampling plan? (13)

5. (a) Distinguish between Consumer's risk and Producer's risk in the context of sampling plans. Obtain its expression for Single sampling and Double Sampling plan.

(b) Suppose that for a single sampling plan ,we have $N = 10{,}000, n = 89$, and $c = 2$, and that incoming lots are of quality $p = 0.01$. At $p = 0.01$, we have Probability of acceptance $P_a = 0.9397$.Find the expression for AOQ and and the ATI of the Single sampling Plan. (8,5)

Unit-II

6. (a) Discuss the forward and backward difference method. Obtain the function whose first differnce is $8x^3+12x^2-20x+16=0$.

(b) Use Newton's interplation formula to find the value of y when x=12, if the following values of x and y are given :

x:	7	8	11	13
y:	14	15	16	18

(8,5)

7. (a) Explain Simpson's one.third method for solving integration.

(b) Evaluate $\int_0^6 \frac{dx}{1+2x+x^2}$ by using (i) Trapezoidal rule (ii) Simpson's one third method. (5,8)

8. (a) Consider the following LPP : Maximize $4x_1 - 2x_2$

subject to $3x_1 + 2x_2 \geq 3$

$2x_1 + 4x_2 \leq 4$

$x_2 \leq 5, x_2 \geq 0$

Solve this problem graphically and also using the simplex method.

(b) What do you mean by non-degenerate solution in transport method? Which method we use to solve the transport problems? Explain one optimal method of a transportation problem with suitable example. (8,5)

9. (a) Consider the following LP

Maximize $z = 2x_1 + 4x_2 + 4x_3 - 3x_4$

s.t. $x_1 + x_2 \leq x_1 + 4x_2 \leq 8$;

$x_1 \geq 0, x_2 \geq 0.$

Find the dual of this LP and its optimal solution.

(b) Find the initial basic feasible solution of the following transportation problem by the North-West Corner rule.

(3)

Warehouse ⇨ / Factory ⇩	W_1	W_2	W_3	W_4	Factory Capacity
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Ware house Requirement	5	8	7	14	

(8,5)

x-x-x