Exam.Code:0006
Sub. Code: 17539

2046

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.1 which is compulsory and selecting two questions from each Unit. Use of simple non-programmable calculator is allowed. Statistical tables and log tables will be provided on request.

x-x-x

1. Answer briefly the following:

(a) What do you understand by quality assurance?

(b) Define Assignable causes of variation in statistical quality control.

(c) What is meant by divided differences in interpolation?

(d) State the Trapezoidal Rule for numerical integration.

(e) Define feasible solution in Linear Programming Problem (LPP). (3, 3, 3, 2, 2)

Unit-I

2. (a) Define Statistical Quality Control. Discuss its importance in modern industrial production systems.

(b) Explain the difference between process control and product control. (7,6)

3. (a) Explain the construction and working of $\bar{X}$-chart and R-chart used for control of variables.

(b) Discuss the advantages and limitations of control charts in industrial quality control. (8,5)

4. Explain the double sampling plan in acceptance sampling with the help of a flow chart. Discuss its advantages and disadvantages. (13)

5. (a) Explain the Operating Characteristic curve for single sampling plan and discuss its interpretation.

(b) What do you understand by Average Outgoing Quality Limit? (9,4)

Unit-II

6. (a) Derive Newtons's Forward interpolation formula.

(b) The following data give the speed of a vehicle at different times:

Time (sec):	0	5	10	15	20
Speed (m/s):	3	6	9	12	15

Estimate the distance travelled in 20 seconds using the Trapezoidal Rule. (7,6)

P.T.O

7. (a) Find the first derivative of y w.r.t x at $x = 4$ using Newton's Backward Difference Formula.

x	0	1	2	3	4	5
y	1	2	5	12	15	18

(b) Solve the following system of equations using the Gauss–Seidel Method up to three iterations.

$$10x + y + z = 12$$
$$2x + 10y + z = 13$$
$$2x + 2y + 10z = 14$$

Take initial values as $x = 0, y = 0, z = 0$. (8,5)

8. (a) Explain the Duality in Linear programing problem. What are its advantages.

(b) A factory produces two products A and B. Each unit of product A requires 2 hours of machine time and 1 hour of labour, while each unit of product B requires 1 hour of machine time and 2 hours of labour. The factory has 100 hours of machine time and 80 hours of labour available per week. The profit per unit is 40 for A and 30 for B. Formulate the Linear Programming Problem to maximize profit. (7,6)

9. (a) Solve the following LPP using the Simplex Method.

Maximize

$$Z = 5x_1 + 4x_2 + 3x_3 + 6x_4$$

Subject to

$$2x_1 + x_2 + x_3 + x_4 \leq 10$$
$$x_1 + 3x_2 + 2x_3 + x_4 \leq 15$$
$$2x_1 + 2x_2 + x_3 + 3x_4 \leq 18$$
$$x_1, x_2, x_3, x_4 \geq 0$$

(b) Find the initial basic feasible solution using Vogel's Approximation Method.

	Destination				**Supply**
Source		D1	D2	D3	
	S1	19	7	50	7
	S2	70	9	40	9
	S3	40	18	70	18
	Demand	5	8	21	

(8,5)

x-x-x