

2045

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) Define rectifying inspection in acceptance sampling.
- (b) What are the two main causes of variations in quality?
- (c) What is the purpose of a difference table in interpolation?
- (d) Write the formula for Simpson's One-Third Rule.
- (e) What is the significance of duality in linear programming?

(3, 3, 3, 2, 2)

Unit – I

- 2. (a) Discuss the role of statistical process control in manufacturing industries. How does it contribute to reducing defects and improving quality?
(b) Discuss the advantages and limitations of using \bar{X} and R charts for quality control in manufacturing. (7, 6)
- 3. (a) Discuss the concept of control limits in control charts. How are they determined, and why are they important?
(b) Describe the working of a p-chart in quality control. How is it different from an np-chart? (7, 6)
- 4. (a) Describe the construction and interpretation of a c-chart. How are control limits determined for this chart?
(b) Define the following terms:
 - (i) Consumer's risk
 - (ii) Operating Characteristic (OC) Curve
 - (iii) Lot Tolerance Percent Defective(7, 6)
- 5. Explain in detail the construction of a single sampling plan with a step-by-step procedure and a well-labeled flow diagram. Obtain the ASN, ATI, and OC functions for the single sampling plan. Also, discuss its merits and demerits. (13)

(2)

Unit - II

6. (a) Explain the Gauss-Seidel iterative method for solving a system of linear equations. Discuss the conditions for its convergence.
 (b) The values of $\sin x$ are given below for different value of x . Find the value of $\sin 32^\circ$.

x:	30°	35°	40°	45°	50°
y:	0.5	0.5736	0.6428	0.7071	0.7660

(7, 6)

7. (a) Discuss Newton's method of backward differences for interpolation, explaining its formula, applications, advantages, and limitations with a suitable example.
 (b) Find $f'(x)$ at $x = 5$ for the following data:

x:	0	2	3	4	7	9
f(x):	4	26	58	112	466	922

(7, 6)

8. (a) Explain the meaning of a linear programming problem stating its uses and give its limitations.
 (b) Solve the linear programming problem by using the two-phase simplex method:
 Maximize $Z = 5X_1 - 4X_2 + 3X_3$
 Subject to

$$\begin{aligned}
 2X_1 + X_2 - 6X_3 &= 20 \\
 6X_1 + 5X_2 + 10X_3 &\leq 76 \\
 8X_1 - 3X_2 + 6X_3 &\leq 50 \\
 X_1, X_2, X_3 &\geq 0.
 \end{aligned}$$

(5, 8)

9. (a) What is a transportation problem? Explain North-West corner rule for finding initial solution for a transportation problem.
 (b) Find the initial basic feasible solution to the following transportation problem using matrix minima method.

		Destination			Supply
		A_1	B_1	C_1	
Origin	A	2	7	4	5
	B	3	3	1	8
	C	5	4	7	7
	D	1	6	2	14
Demand		7	9	18	

(7, 6)