

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 a Producer and Producer's risk?
- (b) Distinguish between defect and defective.
- (c) What are the assumptions of extrapolation techniques?
- (d) Define Simpson's one third formula
- (e) What do you mean by duality in linear programming? (3, 3, 3, 2, 2)

Unit – I

- 2. (a) Explain the term Statistical quality control? How is the process control achieved with the help of control charts? What benefits are expected out of the use of control charts?
(b) Distinguish between control charts for variables and control chart for attributes. Discuss the advantages and disadvantages of control charts for variables and control chart for attributes. (7, 6)
- 3. (a) What do you understand by control chart for number of defects per unit? Explain its construction along with assumptions involved.
(b) Write the control limits for mean and range chart. Explain the usefulness of mean and range chart. (8, 5)
- 4. What is sampling inspection? Explain single sampling plan and double sampling plan with their flow charts. Distinguish between single and double sampling plans. Discuss their relative merits and demerits. (13)
- 5. (a) Define operating characteristic (OC) curve of a sampling plan. Discuss its characteristics. What is ideal shape of OC curve? Derive expression for OC curve for double sampling plan.
(b) What do you understand by Acceptable quality level and average outgoing quality limit? (9, 4)

- 6 (a) Prove that n^{th} divided differences of a polynomial of degree n are constant.
 (b) From following table, estimate the number of students who obtained marks between 75 and 80:

Marks	35-45	45-55	55-65	65-75	75-85
Number of students	18	40	64	50	28

(7, 6)

- 7 (a) Solve the following system of equations using the Gauss-Seidel iteration method:

$$\begin{aligned} 20x - y - 2z &= 17, \\ 3x + 20y - z &= -18, \\ 2x - 3y + 20z &= 25. \end{aligned}$$

- (b) Evaluate $\int_{0.1}^1 (1 + x^3) dx$ by using Simpson's one third formula with step size 0.1.
 Compare with exact value also.

(6, 7)

- 8 (a) What are the essential characteristics of linear programming model? What do you mean by infeasibility and unboundedness in linear programming?
 (b) Solve the following linear programming problem by simplex method:

$$\text{Maximize } Z = 2x_1 + x_2 - 3x_3 + 5x_4$$

Subject to

$$\begin{aligned} x_1 + 7x_2 + 3x_3 + 7x_4 &\leq 46, \\ 3x_1 - x_2 + x_3 + 2x_4 &\leq 8, \\ 2x_1 + 3x_2 - x_3 + x_4 &\leq 10, \\ x_1, x_2, x_3, x_4 &\geq 0. \end{aligned}$$

(5, 8)

- 9 (a) What is duality in linear programming problems? Write the advantages of duality. Prove that dual of dual is primal.
 (b) Find the initial basic feasible solution of the following transportation problem using Vogel's approximation method:

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

(8, 5)