

U.G. 5th Semester Examination - 2021**STATISTICS****[PROGRAMME]****Discipline Specific Elective (DSE)****Course Code : STATG-DSE-T-1A**

Full Marks : 50(40+10)

Time : $2\frac{1}{2}$ Hours*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable. Notations and symbols have their usual meaning.***Answer all the questions from selected Option.****OPTION-A****STATG-DSE-T-1A****(Statistical Quality Control)**

1. Answer any **five** questions: $2 \times 5 = 10$
- What is the rationale of Shewhart's control charts?
 - Why is product control important?
 - Define OC curve of a sampling plan.
 - Distinguish between defects and defectives.
 - What are rational subgroups?
 - What is sampling inspection plan?
 - Explain the meaning of LTPD.

h) What is average total inspection?

2. Answer any **two** questions: $5 \times 2 = 10$
- Explain clearly chance causes and assignable causes of variation in process control.
 - While preparing the control chart for process mean, how one can estimate the process standard deviation if it is unknown? State whether the estimate is valid when the underlying distribution is not normal.
 - How can you determine a single sampling inspection plan when the consumer risk and LTPD are specified?
 - Write a note on ISO quality standard.
3. Answer any **two** questions: $10 \times 2 = 20$
- Develop control limits on p-chart for equal sample sizes. State the problem when sample sizes vary. Give a method to judge the nature of the state of the process in this case.
 - Derive the control limits for a manufacturing process where each item is observed for the number of defects it contains. How do you take care of the situation when the subgroup sizes are not equal? $5 + 5$

- c) Describe an acceptance-rectification type single sampling inspection plan for attribute. Give an outline of the average outgoing quality-based method for determining the plan parameters involved in the single sampling inspection plan.

5+5

- d) Describe double sampling inspection plans. Give an outline of methods for determining the constants involved in double sampling plan.

4+6

[Internal Assessment: 10]

OPTION-B
STATG-DSE-T-1A
(Operations Research)

1. Answer any **five** questions: 2×5=10
- a) Define convex hull of a given set of E^n .
 - b) Why are artificial variables needed for solving a linear programming problem?
 - c) Write down the optimality condition for a given transportation problem.
 - d) Define two-person zero sum game.
 - e) What is a spanning tree?
 - f) What is the optimality criterion for solving a two-person zero sum game?
 - g) What is lead time in an inventory model?
 - h) What is dominance?
2. Answer any **two** from the following: 5×2=10
- a) Write down the primal form of a linear programming problem and its dual. How are the optimal solutions of these two problems related?
 - b) Write down the mathematical formulation of an assignment problem. How does this problem differ from a transportation problem?

- c) Consider the following transportation problem that minimizes the total transportation cost:

	D ₁	D ₂	D ₃	D ₄	a _i
O ₁	1	2	1	4	30
O ₂	3	3	2	1	50
O ₃	4	2	5	9	20
b _j	20	40	30	10	100

(O: Origin, D: Destination)

A feasible solution to this problem is $x_{11}=20$, $x_{12}=10$, $x_{22}=30$, $x_{23}=20$, $x_{33}=10$, $x_{34}=10$.

- Check whether this solution is a basic feasible solution.
 - If yes, check whether it is optimal or not.
 - If not, obtain an improved solution.
- d) Write down the expression for total cost per unit time for a classical EOQ model, explaining all the symbols used. Hence derive the EOQ and the ordering cycle length.

3. Answer any **two** questions: $10 \times 2 = 20$

- Write down the fundamental theorem of game theory.
- What is saddle point in connection with a matrix game? Derive the optimal strategies for a 2×2 game without a saddle point. $2 + 8$

- When is a linear programming problem said to have an unbounded solution? How can one identify the existence of an unbounded solution during the execution of simplex algorithm?
 - What is ABC analysis of inventory control? Discuss different steps of this analysis.

4+6

- Derive the optimum order quantity for a classical EOQ model with a single price break.
- Write a note on post-optimality analysis in linear programming.

[Internal Assessment: 10]
