

U.G. 5th Semester Examination - 2024**STATISTICS****[PROGRAMME]****Discipline Specific Elective (DSE)****Course Code : STAT-G-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****STAT-G-DSE-T-1A****(Statistical Quality Control)**

1. Answer any five questions: $2 \times 5 = 10$
- a) Distinguish between product and process control.
 - b) Explain the meaning of AOQ.
 - c) State the control limits for p-chart.
 - d) What are the seven tools of SPC?
 - e) What do you mean by consumer's risk and producer's risk?

[Turn Over]

- f) What is specification limit?
- g) What is average total inspection?
- h) When does a control chart detect the process to be out of control even if all the points lie inside the control limits?

2. Answer any two questions: $5 \times 2 = 10$

- a) Distinguish between single and double sampling plans.
- b) Define process capability ratio and derive its confidence interval.
- c) 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.
- d) Describe Dodge and Romig's sampling inspection plan.

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

- a) How do you calculate control limits for c-chart? Discuss the assumptions and approximations involved in the calculations. Give some examples of defects for which the c-chart is applicable.

- b) Distinguish between the charts for variables and charts for attributes. Is it possible to use the latter for former? If so, when and how this can be done?
- c) Describe the method of single sampling plan and derive its LTPD and AOQL.
- d) What is a control chart? Explain the basic principles underlying the control charts. Discuss the construction of control charts for mean when the standard values are given and not given.

[Internal Assessment: 10]

OPTION-B
STAT-G-DSE-T-1A
(Operations Research)

1. Answer any five questions: $2 \times 5 = 10$

- a) What are the characteristics of a good Operations Research model?
- b) How does Charnes' big-M technique handle artificial variables in LPP?
- c) What is the graphical solution method in Linear Programming and when is it applicable?
- d) When is an LPP said to have an unbounded solution?
- e) Why is Vogel's Approximation Method (VAM) considered efficient for finding an initial feasible solution in a Transportation Problem?
- f) What is a mixed strategy in game theory and when is it used?
- g) State one real-life application each for the shortest route problem and the minimal spanning tree problem.
- h) Mention two special cases encountered in the Assignment Problem and how they are addressed.

2. Answer any two questions: $5 \times 2 = 10$

- a) What is duality in Linear Programming? Derive the dual of a given LPP and explain its significance.
- b) Briefly discuss the steps involved in solving a Transportation Problem using MODI method.
- c) Explain the minimax-maximin principle with an example. How does this principle help in decision-making?
- d) A firm faces the following annual demand and inventory costs: Annual demand = 1000 units, Setup cost per order = \$50, Holding cost per unit per year = \$5. Determine the EOQ and the total cost.

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

- a) Discuss the importance of Operations Research in decision-making processes across various industries. Include examples to illustrate its applications. $6 + 4$
- b) Discuss the Hungarian method in detail for solving Assignment Problems. Explain its algorithm with an appropriate example. $5 + 5$
- c) Derive the optimal strategies for a rectangular game without saddle point.