2005

STATISTICS

Paper 2

Time : 3 Hours]   *[Maximum Marks : 300*

INSTRUCTIONS

*Candidates should attempt **all** the questions in Parts A, B & C. However, they have to choose only **three** questions in Part D. The number of marks carried by each question is indicated at the end of the question.*

Answers must be written in English.

This paper has four parts :

A	20 marks
B	100 marks
C	90 marks
D	90 marks

Marks allotted to each question are indicated in each part.

Assume suitable data if considered necessary and indicate the same clearly.

Notations and symbols used are as usual.

22/2

4×5=20

PART A

Each question carries 5 marks.

1. (a) Prove that in SRSWOR sample mean is unbiased for population mean.

   (b) Explain the term "consumers risk" with a suitable example.

   (c) Give a flow-chart to obtain mean and variance of given n numbers.

   (d) Describe type of demographic data and indicate major sources of demographic data.

PART B

10×10=100

Each question carries 10 marks.

1. Define ratio estimator for the ratio of population totals and obtain approximate variance of the estimator.

2. Describe systematic sampling. State some advantages of the same.

3. Describe a control chart. Explain a method of developing a control chart.

4. Describe CUSUM chart. State its advantages over $\overline{X}$-chart.

5. Define OR. Describe the scope of OR by considering suitable models.

6. What is a queueing system ? Obtain expression for steady-state probabilities for the M/M/1 queueing system.

7. Describe a Linear Programming Problem. Solve the following by graphical method.

   Maximize $z = 3x + 2y$, where $x \le 10$, $y \le 15$ and $x + y \le 20$.

8. Explain a method to determine seasonal variation in a time series.

9. Discuss a method to find the elasticity of a demand for family budget data.

10. Define (i) Gross Reproduction Rate (GRR), and (ii) Net Reproduction Rate (NRR). Prove or disprove : NRR $\le$ GRR.

PART C

6×15

Each question carries 15 marks.

1. Describe stratified sampling. Obtain the variance of the estimator of the population mean, under Neyman allocation.

2. Explain the terms (i) reliability (ii) failure rate. Obtain the reliability function if the failure rate $r(t) = t$, $t > 0$.

3. Let S_1 and S_2 be respectively a series and a parallel system of two components. Let the life times of the components be independent and exponential with mean 1000 hrs. Find the reliability functions of the two systems.

4. In an invetory model develop an expression for optimum quantity to be ordered when the demand is known. Describe the model and assumptions clearly.

5. Describe components of a time series. Explain moving average method for measuring the trend.

6. Describe a stable population model. Explain how this model can be used to estimate the demographic parameters.

PART D

$3 \times 30 = 90$

*Answer any **three** of the following questions. Each question carries 30 marks.*

1. Explain the terms (i) factorial experiment (ii) confounding. Carry out the analysis of a 2^3-factorial experiment without confounding and also when ABC is confounded.

2. Describe an acceptance sampling plan and clearly indicate the advantages and disadvantages of such plans. Define and describe the uses of OC and AOQL.

3. Describe an assignment problem and explain this can be viewed as an LPP. Explain a method to solve an assignment problem.

4. Describe the importance and limitations of index numbers. Prove that Fisher's ideal index satisfies the time reversal text.

5. Explain the structure of a complete life table. Describe a method of constructing abridged life table.