

U.G. 4th Semester Examination - 2025**STATISTICS****[MAJOR]****Course Code : STAT-MJ-T-5****(SQC and Demography)****[NEP-2020]**

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.*

1. Answer any five questions : 2×5=10
- a) Why Crude birth rate is not a proper rate of fertility?
 - b) Explain the nature of growth of the population when $NRR=1$.
 - c) What are the important properties of a logistic curve?
 - d) Stating the assumptions, prove that $L_x = (1_x + 1_{x+1})/2$.

[Turn over]

- e) Distinguish between product control and process control.
- f) Explain the basic principles underlying Shewhart's control charts.
- g) What do you mean by rational subgroup in connection with control charts?
- h) Distinguish between consumer's risk and producer's risk in sampling inspection plans.

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

- a) Define operating characteristic (OC) curve in the context of sampling inspection plans. How can you compare two sampling plans on the basis of their OC curves?
- b) Derive the control charts for number of defects when (i) standards are given and (ii) standards are not given.
- c) Define Gross Reproduction Rate (GRR) and Net Reproduction Rate (NRR). Show that for any community $NRR < GRR$.
- d) Starting from suitable assumptions regarding relative growth rate of the population, derive the equation of the logistic curve.

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

- a) Describe single sampling inspection plan by attributes. Explain how do you derive unknown sample size (n) and acceptance number (c) with
 - i) Specified AOQL and
 - ii) Specified lot tolerance fraction defective, process average and consumer's risk. $3+7$
- b)
 - i) Derive the control charts for mean for when standards are given and standards are not given.
 - ii) Describe the criterion for detecting lack of control in mean chart. $6+4$
- c) Describe the structure of a complete life table. Discuss how the different columns of a complete life table may be computed on the basis of observed age-specific mortality rates. $6+4$
- d)
 - i) Describe Rhodes method for fitting a logistic curve to the population data.
 - ii) Distinguish between stable population and stationary population. $7+3$

[Internal Assessment: 10]