

FOURTH SEMESTER M.A./M.Sc. DEGREE EXAMINATION, MAY/JUNE 2019

(CBCS)

Statistics

Paper STCT 4.3—STATISTICAL QUALITY CONTROL AND RELIABILITY THEORY

Time : Three Hours

Maximum : 75 Marks

Question 1 is compulsory.*Answer any four from the remaining.**Each question carries 15 marks.*

1. (a) Explain "control chart technique".
- (b) Describe procedure's risk and consumer's risk.
- (c) Explain the operation of CSP-1.
- ✓ (d) Define block replacement policy.
- (e) Compare Type I censoring and Type II censoring.

(5 × 3 = 15 marks)

- ✓ 2. (a) Describe construction of \bar{x} and s charts.

- (b) Illustrate how extreme value control charts are constructed.

(8 + 7 = 15 marks)

- ✓ 3. (a) Explain the control charts for p and c when sample size is varying.

- (b) Derive OC function of C-chart.

- (c) Discuss rational subgrouping.

(6 + 4 + 5 = 15 marks)

4. (a) Explain construction of demerit control chart.

- (b) Compare Shewart control chart technique with a ANOVA technique and the Chi-square test.

(7 + 8 = 15 marks)

5. (a) Describe the operation of multiple sampling plan. Obtain its OC function.

- (b) Explain sequential sampling plan.

(7 + 8 = 15 marks)

Turn over

Passer
Passer
Passer

✓ 6. (a) Show that $IFR \Rightarrow IFRA \Rightarrow NBU \Rightarrow NBUE$.

(b) Discuss IFR and DFR nature of failure rate of gamma life distribution.

(c) Describe cumulative damage shock model.

(6 + 5 + 4 = 15 marks)

✓ 7. (a) Define (i) Series system (ii) Parallel system.

Find the expression for reliability and mean life time of series system of two components whose life times are independent $\exp(\theta_1)$ and $\exp(\theta_2)$ random variables. $\frac{\theta_1^2 \theta_2^2 + 2\theta_1 \theta_2}{\theta_1 + \theta_2}$

(b) Define renewal function. Prove that the renewal equation satisfies :

$$M(t) = \int_0^t (1 + M(t-x)) dF(x).$$

(c) Outline a test to test the mean life of components, when life times are exponentially distributed and the data on number of survivals during $(0, t)$ is available.

(5 + 4 + 6 = 15 marks)

8. (a) State and prove characterization property of (i) IFRA (ii) NBU class of life distribution.

(b) Find the MLE and UMVUE of reliability function when the data on life times of components having exponential distribution is available.

(6 + 9 = 15 marks)