

SC(MP)ACFTCE(09MY)

STATISTICS

Time Allowed : 3 hours

Full Marks : 100

*Attempt any 5 (five) questions
taking at least 2 (two) questions from each section
All questions carry equal marks.*

SECTION A

1. (a) State and prove Bayes theorem.
(b) If X_1 and X_2 be two independent random variables with Poisson distribution. Find the conditional distribution of X_1 given $X_1 + X_2$.
2. (a) State and prove Lindeberg-Levy central limit theorem.
(b) Define complete sufficient statistics. State and prove Lehmann-Scheffe theorem. Also explain how it can be used for finding uniformly minimum variance unbiased estimators.

(Contd. 2)

3. (a) Derive the likelihood ratio test for testing the hypothesis $\mu = \mu_0$ against $\mu \neq \mu_0$ on the basis of a random sample size n from a normal distribution with mean μ and variance unity.
- (b) Describe Kolmogorov-Smirnov test of goodness of fit, stating necessary assumptions, for both one-sided and two-sided alternatives.
4. (a) If y_1, y_2 and y_3 are uncorrelated observations with a common variance σ^2 and expectations $E(y_1) = \theta_1 + \theta_2$, $E(y_2) = \theta_1 + \theta_3$ and $E(y_3) = \theta_1 + \theta_2$ then
- (i) show that $l_1 y_1 + l_2 y_2 + l_3 y_3$ is estimable if and only if $l_1 = l_2 + l_3$
- (ii) find an unbiased estimate of σ^2
- (b) What do you understand by regression method of estimation? Apply regression method of estimation of population mean. Also obtain the expression of mean square error of the regression estimator and show that it is more efficient than the sample mean and ratio estimator under SRSWOR.
5. (a) Describe Warner's randomized response technique for sensitive characteristic.
- (b) What are factorial experiments? Give a complete analysis of 2^2 factorial experiment in RBD.

(Contd. 3)

SECTION B

6. (a) Describe the common control charts in use. How do you measure the efficiency of a control chart?
(b) Describe the double sampling plan and discuss its relative advantages of doubling sampling plan over single sampling plan.
7. (a) Examine Weibull distribution as a failure model. Derive its hazard function.
(b) Explain the differences between a transportation problem and an assignment problem. Show that the latter is a special case of a linear programming problem.
8. Write notes on the following:
 - (a) Homogeneous discrete time Markov Chains
 - (b) Validity of the test scores
9. (a) State Laspeyre's formula for a price index number and examine whether it satisfies the time and factor reversal tests.
(b) What is meant by time series? Explain the difference between the seasonal and cyclical variations in a time series.
10. (a) Explain – infant mortality rate, crude death rate and standardized death rate.
(b) Illustrate the need for scaling of test scores. Define T-score, Standard score and Percentile score.