M.SC DEGREE EXAMINATION, Model QP
STATISTICS - First Semester

PROBABILITY THEORY AND DISTRIBUTIONS

Time : Three hours **Maximum : 70 marks**

Answer ALL Questions. (5X14 = 70 marks)

UNIT – I

1. (a) Define minimal field. Explain the procedure of obtaining a minimal filed over a class σ-filed. Extend this procedure to arrive at the minimal σ-filed.
   (b) State and prove the continuity theorem.

OR

2. (a) Explain limit Supremum and limit infimum of sequence of sets.
   (b) Describe axiomatic definition of probability and their properties.

UNIT – II

3 (a) Define characteristic function. Explain inversion formula.
(b) Describe conditional expectation and characteristic function.

OR

4. (a) State and prove Holder's inequality.
   (b) Define i) random variable ii) Distribution function. State and prove Hajek-Ranyi.

UNIT – III

5. (a) Explain the types of convergence and establish their interrelations.
   (b) State and prove the necessary and sufficient condition of W.L.L.N.

OR

6. (a) State and prove Kolmogorov's strong law of large numbers.
   (b) State and prove Chebychevs's form of W.L.L.N.

UNIT - IV

7. (a) Derive Distribution for Poisson.
   (b) Obtain the m.g.f. of truncated binomial distribution and hence, find its mean and variance.

OR

8. (a) Define two parameter Laplace distribution and obtain its CF. Derive additive property of CF.
   (b) Define Pareto distribution. Obtain its characteristic function, mean and variance.

UNIT - V

9. (a) Explain distribution of Range in case of Exponential distribution.
   (b) Write about importance of order statistics.

OR

10. (a) Define order statistics and obtain joint PDF of and x (i) x (j) 1 <= j <= n
    (b) Derive distribution function of r^{th} order statistic x (r) :1<= r<= n .

M.SC DEGREE EXAMINATION, Model QP
STATISTICS - First Semester

STATISTICAL COMPUTING USING R

Time : Three hours **Maximum : 70 marks**

Answer ALL Questions. (5X14 = 70 marks)

UNIT – I

1. (a) Explain assignment, relation and miscellaneous operators using in 'R'.
   (b) Describe integer, raw, numeric, logical, complex Data types in 'R'.

OR

2. (a) Write about creating vectors, Manipulating vectors, addition of vectors with suitable example.
   (b) A: 1, 5, 9, 12, 15, 16, 19, 20, 25, 31, 35, 43, 12, 9, 6
   B: 5, 9, 12, 19, 22, 31, 5,9
   Compute: A+B, B.A, A/B, A^2, A^3+3A^2+2B+5.

UNIT – II

3. (a) Compute A.B for the following vector converted into matrix.
   A: {3, 5, 9, 15, 19, 21, 23, 24, 26}
   B: {1, 3, 5, 6, 7, 9, 8, 6, 4}.
   (b) Write about R-data frames, adding rows and variables to data frames.

OR

4. (a) Write briefly about Retrieving files using file. Choose ().
   (b) Explain about writing data files from other files.

UNIT – III

5. (a) Derive R-codes for Statistical summary with an example.
   (b) Describe Loop control statements with an example.

OR

6. (a) Explain paired t-test, Correlation and Regression using 'R' with an example..
   (b) Describe apply, sapply, lapply and tapply functions.

UNIT - IV

7. (a) Explain Wilcoxon Mann - Whitney U-test by using R.
   (b) Describe R- Codes for Exponential, Weibull distributions using R.

OR

8. (a) Explain procedure for computing pdf, cdf for Exponential, Weibull Distribution.
   (b) Describe of fitting of Poisson and normal distribution and their goodness of fit using 'R'.

UNIT - V

9. (a) Describe fitting of Q-Q plot, bar chart, line charts by using 'R'.
   (b) Explain Built in R-syntax for one-way ANOVA and two-way ANOVA.

OR

10. (a) Write about box Whisker plots, dot plot Scatter plots in R.
    (b) Write about multiple plots in single page, polygon, text and mtext in R.

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M.SC DEGREE EXAMINATION, Model QP
STATISTICS - First Semester

ESTIMATION

Time : Three hours **Maximum : 70 marks**

Answer ALL Questions. (5X14 = 70 marks)

UNIT-I

1. (a) Explain the concepts of consistent estimator and efficient estimator.
   (b) Prove that a statistic t_n such that (i) $E(t_n) = \theta_n \to \theta$ and (ii) $Var(t_n) \to \theta$ as n $\to \infty$ is consistent estimator of θ.

OR

2. (a) Discuss about the concept of minimal sufficient statistic.
   (b) State and prove the Fisher- Neyman Factorization theorem.

UNIT-II

3. (a) State and prove Rao-Blackwell theorem.
   (b) Show that the minimum variance unbiased estimator if it exists, is unique.

OR

4. (a) State and prove Lehmann- Scheffe theorem. Give the importance of this theorem.
   (b) Explain the Fisher's definition of asymptotic efficiency. Give the definition of CAN, CUAN and the best CUAN estimators.

UNIT-III

5. (a) Explain Moment method of estimation.
   (b) Show that the maximum likelihood estimator if it exists is unique.

OR

6. (a) Show that for large sample the minimum Chi-Square equations and the likelihood equations are identical.
   (b) Obtain the method of moments estimators for the parameters of a rectangular population $R[\alpha, \beta]$ based on a random sample of size 'n'.

UNIT-IV

7. (a) Distinguish between the problems of point estimation and interval estimation.
   (b) Discuss about the relation between confidence estimation and testing of hypothesis.

OR

8. (a) What are UMA, UMAU confidence sets? How do you construct them?
   (b) Explain (i) Loss function (ii) Risk function (iii) Minimax Estimator and (iv) Bayes Estimator.

UNIT-V

9. (a) What are censored and Truncated distribution? Give their applications.
   (b) Explain the Truncated Normal distribution.

OR

10. (a) Describe the Type 2 censoring for Normal distribution.
    (b) Discuss about the Type 1 censoring for Exponential distribution.

M.SC DEGREE EXAMINATION, Model QP
STATISTICS - First Semester

SAMPLING THEORY

Time : Three hours **Maximum : 70 marks**

Answer ALL Questions. (5X14 = 70 marks)

UNIT – I

1. (a) Distinguish between Stratified Random Sampling and Systematic Random Sampling techniques.
   (b) If a population consists of a linear trend, then show that $Var(\bar{y}_{st}) \le Var(\bar{y}_{sys}) \le Var(\bar{y}_n)_R$.

OR

2. (a) Explain Modified Systematic Sampling and centrally located sampling techniques.
   (b) Define the steps involved in a circular systematic sampling scheme for selecting random sample of size n with sample interval k.

UNIT – II

3. (a) Explain cluster sampling technique with equal and unequal cluster sizes.
   (b) Describe the sampling technique with varying probabilities without replacement.

OR

4. (a) Write about Midzuno-Sen Sampling Scheme.
   (b) Explain Horvitz – Thompson estimator and its mean.

UNIT – III

5. (a) Explain double sampling for PPS and derive its variance.
   (b) Describe Two-Stage sampling.

OR

6. (a) Write about optimum allocation in Double Sampling.
   (b) Write briefly about Two Phase sampling for stratification.

UNIT – IV

7. (a) What are the differences among Multistage, Multiphase and Cluster sampling techniques? Give the advantages of Multiphase sampling.
   (b) Explain in brief about Double sampling for Difference and Ratio estimators.

OR

8. (a) Distinguish between Sampling and Non-Sampling errors. Give their sources.
   (b) Write about Deming's model.

UNIT – V

9. (a) Write about Ratio Estimator and derive its variance.
   (b) Derive Mean Square Error for Ratio Estimator.

OR

10. (a) Explain Regression Estimator in Stratified Sampling.
    (b) Explain the comparison of Regression Estimator with Mean per unit Estimator.
