(DMSTT 01)

M.Sc. DEGREE EXAMINATION, DECEMBER 2019.

First Year
Statistics

PROBABILITY AND DISTRIBUTION THEORY

Time : Three hours Maximum : 70 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) Explain the continuity axiom of probability.

   (b) State and prove Bold-Cantilli Lemma.

2. (a) State and prove inversion theorem.

   (b) Explain distribution function and its properties.

3. (a) Explain the convergence of sequence of random variables.

   (b) Explain about the types of convergence with interrelations.

4. (a) State and prove Levy and Lindeberg form of central limit theorem.

   (b) Explain weak laws of large numbers.

5. (a) What is discrete distribution? Explain its characteristics.

   (b) What is m.g.f.? Explain its properties.

6. (a) Explain the interrelations of multinomial.

   (b) What is Compound Poisson? Explain

7. (a) Explain the interrelations of Weibull Distribution.

   (b) Define Probability Generating Function? Explain.

8. (a) Discuss about the logistic distribution. Also find its mean and variance.

   (b) Derive m.g.f. of Laplace Distribution.

9. (a) Explain p.d.f. of a single order.

   (b) What is Order Statistics? Obtain its distribution.

10. (a) Derive the joint p.d.f. of $\left|X_{(1)}, X_{(2)} \ldots\ldots X_{(n)}\right|$.

    (b) Explain sampling distribution of non-central t.

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(DMSTT 02)

M.Sc. DEGREE EXAMINATION, DECEMBER 2019.

First Year

Statistics

STATISTICAL INTERFACE

Time : Three hours Maximum : 70 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) Define a minimum variance unbiased estimator. Show that sample variance is an unbiased estimator for the population variance.

   (b) State and prove Factorization Theorem.

2. (a) State and prove Blackwell Theorem.

   (b) Explain the terms :

   (i) Consistency and

   (ii) CAN estimator.(a)Explain sufficiency. Consider the rectangular distribution with p.d.f. $f_0(x) = 1$, $\theta - \frac{1}{2} < \theta < \theta + \frac{1}{2}$, where $\theta \in (-\infty, \infty)$. Obtain the sufficient statistics for θ.

(b) What is interval estimation? Explain with an example.

3. (a) Obtain confidence limits for the parameter μ in $N(\mu, 1)$ with confidence coefficient $(1-\alpha)$.

(b) Discuss about the interval of estimation.

4. (a) Explain non-randomised and randomised lists.

(b) Explain the concept of monotone likelyhood ratio.

5. (a) Consider n Bernoulli trials with probability of success P for each trial. Derive the likelyhood ratio test for $H_0 : P = P_0$ against $H_1 : P > P_0$ and $H_1 : P < P_0$. Then show that they are identical with UMP tests.

(b) Explain the relationship between testing and interval estimation.

6. (a) Explain the procedure of Mason-Whitney Test.

(b) Explain about the Wilcoxon signed rank.

7. (a) Explain the median test is differentiate in testing two means. Also write procedure of medial list.

(b) Explain the Hann-Whitney Test.

8. (a) Explain SPR test and properties.

(b) Explain Wald's Test and its OC and ASN function.

9. (a) Let X be a random variable having the normal distribution $N(\mu, \theta)$. Where μ is known. Determine the SPR test for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1$ $(\theta_1 > \theta_2)$. Obtain the approximation for its OC and ASN functions.

(b) What is OC and ASN functions? Explain.

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(DMSTT 03)

M.Sc. DEGREE EXAMINATION, DECEMBER 2019.

First Year

Statistics

SAMPLING THEORY

Time : Three hours Maximum : 70 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) What is sample survey? In what respects is it superior to a census survey?

   (b) What are sampling and non-sampling errors faced by the researcher? Explain.

2. (a) What are the main steps involved in a sample survey? Explain.

   (b) Explain about the role of CSO.

3. (a) What is a simple random sample? Mention the various methods of drawing a random sample.

   (b) How do you estimate population mean and proportion in SRS without replacement?

4. (a) Explain about the stratified sampling with examples.

   (b) How do you determine sample by Neyman Allocation Method?

5. (a) Explain the concept of systematic sampling in detail.

   (b) Discuss about the cluster sampling with equal cluster sizes.

6. (a) How do you estimate mean and variance with systematic sampling.

   (b) What is optimum cluster size? Explain.

7. (a) Explain the PPS sampling with replacement.

   (b) Explain the concept circular systematic sampling with examples.

8. (a) Discuss about the estimation of population mean, its variance and estimation of variance.

   (b) Explain two examples where we can use multi-stage sampling.

9. (a) Discuss about the ratio estimation with examples.

   (b) What are the biases of ratio-estimator? Explain.

10. (a) Explain the conditions for optimum ratio estimate.

    (b) Explain the concept of regression estimates in stratified sampling.

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(DMSTT 04)

M.Sc. DEGREE EXAMINATION, DECEMBER 2019.

First Year

Statistics

DESIGN OF EXPERIMENTS

Time : Three hours Maximum : 70 marks

Answer any FIVE questions.

All questions carry equal marks.

1. (a) Prove that is λ is an eigen value of an orthogonal matrix, then $\frac{1}{\lambda}$ is also its eigen value.

   (b) State and prove Cayley-Hamilton Theorem.

2. (a) Derive the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$.

   (b) Explain Cochran's Theorem of quadratic form.

3. Obtain BLUE of the parameters in two-variable linear model. Also explain ANOVA for two-way classification.

4. (a) State and prove Atken's Theorem.

(b) Explain generalised linear models.

5. (a) Explain one-way classification of ANOVA with an example.

(b) Explain about the random and mixed effect models.

6. (a) What is meant by two-way, three-way classification? Explain analysis of covariance of two-way classification.

(b) What are the objectives of ANOVA? Explain its practical applications.

7. (a) Explain the method of estimating several missings plots in LSD.

(b) What is meant by a RBD? Explain.

8. (a) What is meant by mutually orthogonal Latin squares? Explain its procedure.

(b) Explain the analysis of split plot design.

9. (a) Describe the analysis of factorial experiment involving three factors at three levels.

(b) Describe in detail about the analysis of complete and partial confounding in 3^2 factorial design.

10. (a) Define BIBD. Derive its parametric relations and point out different types of BIBD.

(b) Explain the analysis of 2^3 factorial experiment.

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