

(DMSTT01)

Total No. of Questions : 10]

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M.Sc. DEGREE EXAMINATION, MAY – 2018

First Year

STATISTICS

Probability and Distribution Theory

Time : 3 Hours

Maximum Marks :70

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Answer any five questions.

All questions carry equal marks.

- Q1)** a) Define continuity axiom of probability. Explain.  
b) What is mathematical Expectation? Explain in brief.
- Q2)** a) State and prove inversion theorem.  
b) State and prove cantelli lemma.
- Q3)** a) Explain Chebyshev and Khintchin's laws in brief.  
b) Explain the convergence of sequence of random variables.
- Q4)** a) State and prove Levy and Lindeberg form of central limit theorem.  
b) Explain the types of convergence with interrelations.
- Q5)** a) What is moment generating function? Explain its characteristics.  
b) Explain the characteristics of discrete distribution.
- Q6)** a) Write the properties of interrelations of multinomial.  
b) What is compound binomial? Explain in brief.
- Q7)** a) Define lognormal distribution. Write its characteristics.  
b) Write about logistic distribution. Also find its mean and variance.
- Q8)** a) What is probability generating function? Explain in brief.  
b) Derive moment generating function of Laplace distribution.
- Q9)** a) Explain probability density function of a single order.  
b) Derive the joint p.d.f. of  $| X_{(1)}, X_{(2)}, \dots, X_{(n)} |$ .
- Q10)** a) Derive the distribution of non-central chi-square.  
b) Define order statistics and obtain the distribution.



(DMSTT02)

Total No. of Questions : 10]

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M.Sc. DEGREE EXAMINATION, MAY – 2018

First Year

STATISTICS

Statistical Inference

Time : 3 Hours

Maximum Marks :70

Answer any five questions.

All questions carry equal marks.

- Q1)** a) Explain the terms i) sufficiency ii) unbiasedness with examples.  
b) State and prove factorization theorem.
- Q2)** a) State and prove Blackwell theorem.  
b) Let  $x_1, x_2, \dots, x_n$  be a random sample from the distribution with p.d.f.  
$$f_\theta(x) = \frac{1}{B - \alpha}, \text{ if } \alpha < x < \beta \text{ where } \theta = (\alpha, \beta) \text{ and } 0 < \alpha < \beta < \alpha.$$
 Obtain Mvu estimators of  $\frac{\alpha + \beta}{2}$  and  $\beta - \alpha$ .
- Q3)** a) What is interval estimation? Explain with an example.  
b) Describe the maximum likelihood method of estimation. Find an ML estimator for  $\theta$  in  $f(x : \theta) = (\theta + 1)x^\theta, 0 \leq x \leq 1$ .
- Q4)** a) Obtain confidence limits for the parameter  $\mu$  in  $N(\mu, 1)$  with confidence coefficient  $(1 - \alpha)$   
b) Explain the method of moments in brief.
- Q5)** a) State and prove Neymann pearson lemma.  
b) Explain the concept of monotone likelihood Ratio in brief.
- Q6)** a) What is the difference between randomized and non-randomised tests? Explain in brief.  
b) Consider n Bernoulli trials with probability of success p for each trial. Derive the likelihood 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.
- Q7)** a) Explain the procedure of Mann-whitney test in brief.  
b) What are the applications of Wilcoxon test? Explain its procedure.

- Q8)** a) Is there a difference between health services workers and education service workers in the amount of compensation of employers pay them per hour suppose a random sample of seven health service workers is taken along with a random sample of eight education service workers from different parts of the country. Each of their employers is interviewed and figures are obtained on the amount paid per hour for compensation per hour. Use Mann-Whitney test to determine whether these two populations are different in employee compensation.

Health service worker	26.19	19.80	22.36	18.75	21.90	22.96	20.75	-
Education service worker	20.10	23.88	25.50	21.64	24.85	25.30	24.12	23.45

- b) Explain how median test is differentiate in testing two means? Also write the procedure of median test.
- Q9)** a) Describe SPRT procedure in brief.  
b) Define OC and ASN functions of the SPRT.
- Q10)**a) Derive SPR test to test the parameter  $\lambda$  of a Poisson Distribution obtain its OC and ASN functions.  
b) Describe SPRT in the case of normal distribution.



(DMSTT03)

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M.Sc. DEGREE EXAMINATION, MAY – 2018

First Year

STATISTICS

Sampling Theory

Time : 3 Hours

Maximum Marks :70

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Answer any five questions.

All questions carry equal marks.

- Q1)** a) What is the difference between enumeration survey and sample survey? Explain the features of sample survey.  
b) What are sampling and non-sampling errors faced by the researcher? Explain in brief.
- Q2)** a) What are the important aspects should be considered at planning sample survey?  
b) What are the responsibilities of central statistical organization?
- Q3)** a) How do you estimate population mean and proportion in SRS without replacement?  
b) Define simple random process. Explain its merits and drawbacks.
- Q4)** a) Why stratification is important in sample determination? Explain.  
b) How do you determine sample by Neyman allocation method?
- Q5)** a) Define systematic sampling. Write its merits and drawbacks.  
b) How do you estimate mean and variance with systematic sampling?
- Q6)** a) What is optimum cluster size? Explain.  
b) What are the features of cluster sampling? Explain.
- Q7)** a) What is systematic sampling? Write its merits and drawbacks.  
b) Explain the concept circular systematic sampling with an example.
- Q8)** a) Write the merits and draw backs of Multi-stage sampling.  
b) Explain two examples where we can use multi-stage sampling.
- Q9)** a) What are the biases of ratio-estimator? Explain.  
b) Explain ratio estimates in stratified sampling.
- Q10)** a) What is the differences between ratio estimate and regression estimate.  
b) Explain the concept of regression estimates in stratified sampling.



(DMSTT04)

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M.Sc. DEGREE EXAMINATION, MAY – 2018

First Year

STATISTICS

Design of Experiments

Time : 3 Hours

Maximum Marks :70

Answer any five questions.

All questions carry equal marks.

- Q1)** a) Explain the characteristic roots and vectors of a matrix.  
b) State and prove Cauley - Hamilton theorem.
- Q2)** a) Derive the inverse of the matrix
- $$A = \begin{bmatrix} 2 & -1 & 4 \\ 4 & 0 & 2 \\ 3 & -2 & 7 \end{bmatrix}$$
- b) Explain Coehran's theorem for quadratic forms.
- Q3)** a) Explain linear models with examples.  
b) State and prove Gauss Markov theorem.
- Q4)** a) State and prove Atken's theorem.  
b) What is best linear unbiased estimate? Explain in brief.
- Q5)** a) Explain two-way ANOVA with an example.  
b) What are random effect models? Explain analysis of variance of three way classification.
- Q6)** a) What is meant by two-way, three-way classification? Explain analysis of co-variance of two-way classification.  
b) What are the objectives of ANOVA? Explain its practical applications.
- Q7)** a) What is an experiment? Explain the formulation of hypothesis in experiments.  
b) Explain the principles of randomized block design.
- Q8)** a) What is meant by mutually orthogonal Latin Squares? Explain its procedure.  
b) Describe missing plot technique? Explain its applications.
- Q9)** a) What is the importance of factorial experiments? Explain.  
b) Explain the analysis of  $3^2$  factorial experiment.
- Q10)** a) Discuss is brief about intra block analysis of BIBD.  
b) Explain the analysis of  $2^3$  factorial experiment.

