INTERNAL ASSIGNMENT QUESTIONS
M.Sc (STATISTICS) PREVIOUS

2021

PROF. G. RAM REDDY CENTRE FOR DISTANCE EDUCATION
(RECOGNISED BY THE DISTANCE EDUCATION BUREAU, UGC, NEW DELHI)
OSMANIA UNIVERSITY
(A University with Potential for Excellence and Re-Accredited by NAAC with "A" + Grade)

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PROF.G.RAM REDDY CENTRE FOR DISTANCE EDUCATION
OSMANIA UNIVERSITY, HYDERABAD – 500 007

Dear Students,

Every student of M.Sc. Statistics Previous Year has to write and submit **Assignment** for each paper compulsorily. Each assignment carries **20 marks.** The marks awarded to you will be forwarded to the Controller of Examination, OU for inclusion in the University Examination marks. The candidates have to pay the examination fee and submit the Internal Assignment in the same academic year. If a candidate fails to submit the Internal Assignment after payment of the examination fee he will not be given an opportunity to submit the Internal Assignment afterwards, if you fail to submit Internal Assignments before the stipulated date the Internal marks will not be added to University examination marks under any circumstances.

You are required to **pay Rs.300/-** towards the Internal Assignment Fee through Online along with Examination fee and submit the Internal Assignments along with the Fee payment receipt at the concerned counter.

ASSIGNMENT WITHOUT THE FEE RECEIPT WILL NOT BE ACCEPTED

Assignments on Printed / Photocopy / Typed papers will not be accepted and will not be valued at any cost.

Only <u>hand written Assignments</u> will be accepted and valued.

Methodology for writing the Assignments:

1. First read the subject matter in the course material that is supplied to you.
2. If possible read the subject matter in the books suggested for further reading.
3. You are welcome to use the PGRRCDE Library on all working days including Sunday for collecting information on the topic of your assignments.
   (10.30 am to 5.00 pm).
4. Give a final reading to the answer you have written and see whether you can delete unimportant or repetitive words.
5. The cover page of the each theory assignments must have information as given in FORMAT below.

<u>FORMAT</u>

1 NAME OF THE COURSE :
2. NAME OF THE STUDENT :
3. ENROLLMENT NUMBER :
4. NAME OF THE PAPER :
5. DATE OF SUBMISSION :

6. Write the above said details clearly on every assignments paper, otherwise your paper will not be valued.
7. Tag all the assignments paper-wise and submit
8. Submit the assignments on or before **<u>8th November, 2021</u>** at the concerned counter at PGRRCDE, OU on any working day and obtain receipt.

DIRECTOR

Paper – I

M.Sc. STATISTICS - PREVIOUSCDE - ASSIGNMENT - 2021

Paper-I : MATHEMATICAL ANALYSIS & LINEAR ALGEBRA

Date:- **Max. Marks: 20**

Name of the Candidate: ______________________ **Roll No.** ______________

Note: 1. Answer Section-A & Section-B on the Question paper by taking print of these pages.
2. Answer the questions in Section C in the order that specified in Q.P. on white papers.

Section-A

Give the correct choice of the Answer like 'a' or 'b' etc. in the brackets provided against the question. Each question carries half Mark.

1. $f(x) = \begin{cases} 1 & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$ has __________ at $x = 0$.

a) continuity b) removable discontinuity
c) irremovable discontinuity d) discontinuity ( )

2. Derivability of a function at a point implies continuity of the function at that point. Its converse is

a) not true b) true c) cannot be proved
d) true subject to some conditions ( )

3. A function 'f' is said to be a function of Bounded variation if there exists a positive number M such that $\sum_{k=1}^{n}|\Delta f_k|$ ______ M for all partitions on [a, b], where $\Delta f_k = f(x_k - f_{k-1})$.

a) < b) > c) ≤ d) ≥ ( )

4. If f, g, (f+g), (f-g) and f.g are functions of Bounded variation on [a, b], then $V_{fg}(a,b)$ ________ A $V_f(a,b)$ + B $V_g(a,b)$.

a) > b) ≥ c) < d) ≤ ( )

5. Which of the following conditions are equivalent to Riemann – Stieltjes

a) $f \varepsilon R(\alpha)$ on [a,b] b) $\underline{I}(f,\alpha) = \overline{I}(f,\alpha)$ c) neither (a) nor (b) d) both (a) and (b) ( )

6. If A^+ is Moore - Penrose inverse of A, it should satisfy ____________ conditions.

a) AA^+ and A^+A should be symmetric b) $AA^+A = A$ and $A^+AA^+ = A^+$
c) both (a) and (b) d) either (a) or (b) ( )

7. If A is an mxn matrix, its generalized inverse is of order

a) nxm b) mxn c) mxm d) nxn ( )

8. A vector 'X' is said to be orthogonal to onother vector 'Ý' if the inner product of X and Y is

a) positive b) negative c) zero d) All the above three( )

9. If $V_n(F)$ is a vector space and the set $S = \{X_1, X_2, \ldots, X_n\}$ is a finite set of vectors in $V_n(F)$, then the set S is called a basis of subspace if

a) S is linearly independent
b) S spans $V_n(F)$
c) both (a) and (b)
d) neither (a) nor (b) ( )

10. A system of linear equations AX = b is said to be consistent iff

a) $AA^+b = b$ b) $AA^-b = b$ c) neither (a) nor (b) d) either (a) or (b) ( )

Section-B

Fill in the blanks. Each question carries half Mark.

11. A function 'f' is said to tend to a limit 'Ç' as 'x' tends to 'h' if the left limit and right limit exist and are ________________.

12. If $F : [a, b] \varepsilon \Re$ is a function and $a = x_0 < x_1 < x_2 < \ldots\ldots\ldots < x_n = b$, then the set of points $P = \{x_0, x_1, x_2, \ldots, x_n\}$ is called________________.

13. If a function 'f'is monotonic on [a, b] then 'f' is a function of ________________.

14. If $V_f(a,b) = \text{Sup}\{\Sigma P, P \; \varepsilon \; \mathcal{P}[a,b]\}$ is known as ________________ of the function 'f' on [a,b].

15. The function 'f' is said to satisfy ________________ condition with respect to α, if for every $\in > 0$ there exists a partition $P_\in$ such that for every finer partition $P \supset P_\in$, we have $0 \leq U(P, f, \alpha) - L(P, f, \alpha) < \in$.

16. Every Moore - Penrose inverse is also ________________ inverse. But, the converse need not be true.

17. Rank of Moore - Penrose inverse of a matrix A is ________________ the rank of matrix A.

18. If A is an mxn matrix, A^- or A^c is called its generalized inverse if ________________.

19. The number of linearly independent vectors in any basis of a sub-space 'S' is known as ________________ of the sub-space.

20. A system of linear equations AX= b is said to be consistent iff ________________ where B is the augmented matrix.

Section-C

. **Write short answers to the following. Each question carries ONE Mark.**

21. Define removable discontinuity.
22. State Second Mean Value theorem.
23. State the properties of trace of a matrix.
24. State the properties of generalized inverse.
25. Define length of a vector of 'n' elements.
26. Define inner product of two vectors X and Y of order nx1.
27. Define homogeneous and Non-Homogeneous system of equations.
28. State the properties of trace of a matrix.
29. State the properties of generalized inverse.
30. Define Algebraic and Geometric multiplicity of characteristic root.

M.Sc. PREVIOUS (STATISTICS) CDE INTERNAL ASSIGNMENT

PAPER- II: PROBABILITY THEORY

Name of the Candidate: ______________________ **Roll No:**______________

SECTION-A **(10 x ½ = 5 Marks)**

1. If the cumulative distribution function of a random variable X is $F(x) = 0$ if $x < k$ and $F(x) = 1$; if $x \geq k$. Then F(x) is called __________ distribution.
   (a) Uniform (b) Bernoulli (c) Degenerate (d) Discrete Uniform [ ]
2. If A and B are two independent events such that $P(A^c) = 0.7$, $P(B^c) = x$ and $P(A \cup B) = 0.8$ then $x =$
   (a) 0.1 (b) 2/7 (c) 5/7 (d) 1/3 [ ]
3. An experiment is said to be a random experiment if
   (a) All possible outcomes are known in advance (b) Exact outcome is known in advance
   (c) Exact outcome is not known in advance (d) Both (a) and (c). [ ]
4. If the occurrence of one event prevents the occurrence of all other events then such an event is known as ____________event.
   (a) Mutually exclusive (b) Independent (c) Equally likely (d) Favorable [ ]
5. If A and B $\in \xi$ and A $\subseteq$ B then P(A) _________ P(B)
   a) $>$ (b) $<$ (c) $\geq$ (d) $\leq$ [ ]
6. If A and B are two independent events then______________
   (a) A and B^c are also independent (b) A^c and B are also independent
   (c) A^c and B^c are also independent (d) All the above [ ]
7. Match the following inequalities
   a) Chebychev's inequality i) $E(XY)^2 \leq E(X)^2 E(Y)^2$
   b) Markov's inequality ii) $\varphi(E(X)) \leq E(\varphi(X))$
   c) Jensen's inequality iii) $P[|X| \geq \varepsilon] \leq E(X^p)/\varepsilon^p$
   d) Schwartz inequality iv) $P[|X| \geq \varepsilon] \leq E(X^2)/\varepsilon^2$ [ ]
   a) a-iii, b-iv, c-ii, d-i b) a-iv, b-iii, c-ii, d-I c) a-iv, b-iii, c-i, d-ii d) a-iii, b-iv, c-i, d-ii
8. Match the following inequalities
   a) Holder's inequality i) $E(|X+Y|^p)^{1/p} \leq (E|X|^p)^{1/p} (E|Y|^p)^{1/p}$
   b) Lianpunov's inequality ii) $E(|XY|) \leq (E|X|^p)^{1/p} (E|Y|^q)^{1/q}$, $p > 1$
   c) Triangular inequality iii) $E(|X|^r)^{1/r} \leq (E|X|^p)^{1/p}$, $r > p > 0$
   d) Minkowski's inequality iv) $E(|X+Y|^2)^{1/2} \leq (E|X|^2)^{1/2} + (E|Y|^2)^{1/2}$ [ ]
   a) a-iii, b-iv, c-ii, d-i b) a-iv, b-iii, c-ii, d-I c) a-iv, b-iii, c-i, d-ii d) a-iii, b-iv, c-i, d-ii
9. Match the following
   a) Binomial i) $p(1-qe^{it})^{-1}$
   b) Geometric ii) $(q + p\, e^{it})^n$
   c) Cauchy iii) $\exp(-|t|)$
   d) Laplace iv) $(1+t^2)^{-1}$ [ ]
   a) a-i, b-ii, c-iii, d-iv b) a-ii, b-i, c-iv, d-iii c) a-i, b-ii, c-iv, d-iii d) a-ii, b-i, c-iii, d-iv
10. If X follows U(0,12) then $P[|X-6|>4] \leq$ ____ [ ]
   a) 0.75 b) 0.3334 c) 0.25 d) None of these

SECTION-B **(10x ½ =5 Marks)**

1. If the number of items produced during a week is a random variable with mean 200. The probability for weeks production will be at least 250 is ________
2. The joint p.d.f. of (X,Y) is given by $f(x, y) = 2 \quad 0 < y < x$ then the $f(y / X{=}x)$ is _____
3. For any characteristic function $\phi_x(t)$, the real part of $(1-\phi_x(t)) \geq$ ____________
4. Borels SLLN is defined for ______________________ random variables.
5. The WLLN's defined for Bernoulli random variables is known as ________________
6. Demoivre's Laplace CLT is defined for _______________ random variables.
7. ________________SLLN's is a particular case of Kolmogorov's SLLN's.
8. Bochner's stated that, the necessary and sufficient condition for $\phi_x(t)$ to be characteristic function is ________
9. The variance of X~U(5,9) is ______________________________
10. If f(x) is a convex function and E(X) is finite then $f[E(X)] \leq E[f(X)]$ this is known as _____________________ inequality.

SECTION-C **(10 x1 = 10 Marks)**

1. Give the Kolmogorov's definition to the probability.
2. State Inversion theorem of characteristic function
3. State the Uniqueness and inversion theorems for characteristic function
4. State Holder's inequality
5. Define Weak and Strong Law of Large numbers.
6. Define convergence in Probability and Convergence in Quadratic mean.
7. Show that convergence in probability implies convergence in law.
8. State the Levy continuity theorem and give its application
9. State Liapunov Central Limit Theorem
10. State Lindberg Feller Central Limit Theorem

Paper – III

FACULTY OF SCIENCE

M.Sc. (STATISTICS) CDE PREVIOUS, INTERNAL ASSESMENT

PAPER-III : DISTRIBUTION THEORY & MULTIVARIATE ANALYSIS

Date: ____________________ **Max. Marks:20**

Name of the Student ______________________ **Roll No:** __________

Note: 1. Answer Section-A & Section-B on the Question paper by taking print of these pages.
2. Answer the questions in Section C in the order that specified in Q.P. on white papers.

SECTION-A (Multiple Choice : 10 x ½ = 5 Marks)

1. When $n_1 = 1$, $n_2 = n$ and $F = t^2$ then F– distribution tends to.

(a) χ^2 distribution (b) t distribution (c) $F_{(n,1)}$ distribution (d) None [ ]

2. The ratio of Non-central χ^2 variate to the central χ^2 variate divided by their respective degrees of freedom is defined as

(a) Non-central χ^2 (b) Non-central t (c) Non-central F (d) None [ ]

3. Distribution function of minimum order statistics is ___________.

(a) $[F(x)]^n$ (b) $1-[1-F(x)]^n$ (c) $[1-F(x)]^n$ (d) $1+[1-F(x)]^n$ [ ]

4. The Distribution of Quadratic forms is

(a) χ^2 distribution (b) t distribution (c) F distribution (d) None [ ]

5. The conditional density function of Multi-nomial $P[X_1=u / X_2=v]=$

a) ${}^{n-v}C_u\,[\,p_1/(1-p_2)\,]^u\,[\,(1-p_2-p_1)/(1-p_2)\,]^{n-u-v}$ b) $(2\pi)^{-p/2}\,|\Sigma|^{-\frac{1}{2}}\,e^{-\frac{1}{2}(\underline{X}-\underline{\mu})'\Sigma^{-1}(\underline{X}-\underline{\mu})}$

c) ${}^{n-v}C_u\,[\,p_1/(1-p_1-p_2)\,]^u\,{}^{n-v}C_u\,[\,p_2/(1-p_1-p_2)\,]^{n-u}$ d) None of these [ ]

6. The Probability density function of Wishart distribution is

a) $(2\pi)^{-p/2}\,|\Sigma|^{-\frac{1}{2}}\,e^{-\frac{1}{2}(\underline{X}-\underline{\mu})'\Sigma^{-1}(\underline{X}-\underline{\mu})}$ b) $(2\pi)^{-np/2}\,|\Sigma|^{-\frac{1}{2}}\,e^{-\frac{1}{2}(\underline{X}-\underline{\mu})'\Sigma^{-1}(\underline{X}-\underline{\mu})}$

c) $(2\pi)^{-np/2}\,|\Sigma|^{-n/2}\,e^{-\frac{1}{2}(\underline{X}-\underline{\mu})'\Sigma^{-1}(\underline{X}-\underline{\mu})}$ d) None of these [ ]

7. The Characteristic Function of Wishart Distribution is

a) $[\,|\Sigma| / |\Sigma-2it|\,]^{n/2}$ **b)** $[\,|\Sigma^{-1}| / |\Sigma^{-1}+2it|\,]^{n/2}$ **c)** $[\,|\Sigma^{-1}| / |\Sigma^{-1}-2it|\,]^{n/2}$ **d)** None of these [ ]

8 . If $\underline{X} \sim N_P(\mu, \Sigma)$, and $\underline{Y}^{(1)} = \underline{X}^{(1)} + M.\underline{X}^{(2)}$, $\underline{Y}^{(2)} = \underline{X}^{(2)}$ be the a linear transformation such that $\underline{Y}^{(1)}$, $\underline{Y}^{(2)}$ are independent then the value of M is ___________.

a) $\Sigma_{12}\Sigma^{-1}_{22}\Sigma_{21}$ b) $-\Sigma_{12}\Sigma^{-1}_{22}\Sigma_{21}$ c) $-\Sigma_{12}\Sigma^{-1}_{22}$ d) None of these [ ]

9 If $\underline{X} \sim N_P(\underline{0}, I_p)$, consider the transformation $\underline{Y} = B\underline{X}$, the Bartlett's decomposition matrix (B), elements b_{ii}^2 follows _______ distribution

a) Normal b) Wishart c) Chi-square d) F [ ]

10 The correlation between the i^{th} Principal Component (Y_i) and the k^{th} variable(X_k) is

a) 0 b) 1 c) 1/n d) None of these [ ]

P.T.O.

SECTION-B (Fill in the Blanks: 10 x ½ = 5 Marks)

1. When n=2, t- Distribution tends to ________________ distribution.
2. $(n+2\lambda)$ is the mean of ______________________ distribution.
3. If $X_i \sim N(\mu_i, 1)$; i =1,2,3,...n, $\mu_i \neq 0$ independently then $\sum_{i=1}^{n} X_i^2 \sim$ _______________ distribution.
4. If $X_1, X_2, X_3 \sim \exp(1)$ then the distribution function of Maximum ordered statistics is__________.
5. The Correlation coefficient between the two-variates of Multinomial is _______________
6. In case of null distribution, probability density function for simple sample correlation coefficient (r_{ij}) is $f(r_{ij})$ = ____.
7. In case of null distribution, the probability density function for Multiple correlation coefficient R^2 is $f(R^2)$ = ____.
8. The Generalized Variance | **S** | is defined as ____.
9. If $\underline{X} \sim N_P(\underline{\mu}, \Sigma)$ then the distribution of sample mean vector $f(\underline{x})$ =_________________
10. If $\underline{X} \sim N_P(\underline{\mu}, \Sigma)$, and consider a linear transformation $\underline{Y}^{(1)} = \underline{X}^{(1)} + M.\underline{X}^{(2)}$, $\underline{Y}^{(2)} = \underline{X}^{(2)}$ with Covariance $(\underline{Y}^{(1)}, \underline{Y}^{(2)})$ then the variance of $\underline{Y}^{(1)}$ is ______________________________

SECTION-C (5x1=5 Marks)
(Answer the following questions in the order only)

1. Define order statistics and give its applications
2. Define non-central t- and F- distributions
3. Find the distribution of ratio of two chi-square variates in the form X/(X+Y)
4. State the physical conditions of Multi-nomial distribution
5. Obtain the Marginal distribution of Mutinomial Variate.
6. State the applications of distribution of Regression coefficient.
7. State the Properties of Wishart distribution.
8. Obtain the Covariance between two multi-normal variates from its CGF.
9. Define Canonical variables and canonical correlations
10. Explain the procedure for obtaining the Principal components.

FACULTY OF SCIENCE
M.Sc. (STATISTICS) CDE PREVIOUS. INTERNAL ASSESMENT
PAPER- IV: SAMPLING ~~TECHNIQUES~~ AND ESTIMATION THEORY

Date: **Max. Marks:20**

Name of the Student______________________________ **Roll No:**__________

Note: 1. Answer Section-A & Section-B on the Question paper by taking print of these pages.

2. Answer the questions in Section C in the order that specified in Q.P. on white papers.

SECTION-A (Multiple Choice : 10 x ½ = 5 Marks)

1. The maximum likelihood estimates, which are obtained by maximizing the function of joint density of random variables, are generally.

   A. unbiased and inconsistent B. unbiased consistent

   C. consistent and invariant D. unbiased and invariant ( )

2. The errors emerging out of faculty planning of surveys are categorized as

   A. Non– Sampling errors B.Non – response errors C.samplingerrors Absolute errors ( )

3. Under equal allocation in stratified sampling the Sample form each stratum is

   A. Proportional to Stratum size B. of Same size from each Stratum

   C. in proportion to the per unit cost of survey of the Stratum D. All the above ( )

4. A statistic whose variance is as small as possible when compared to any other unbiased estimator is called

   A. MVUE B. BLUE C. MVB D. None of the above ( )

5. A resampling technique which consists of drawing "n" resamples of size m=n-1 each time from the original sample by deleting one observation at a time and uses for estimation of functional of F is called

   A. Bootstrapping B. Sampling C. Jackkniffing D. None of the above ( )

6. A statistic which is CAN but with asymptotic variance equal to MVB is called

   A. UMVUE B. BAN C. MLE D. MVUE ( )

7. A functional parameter for which there exists a functional statistic that is unbiased is called

   A. Non estimable functional parameter B. Non parametric estimation

   C. parametric estimation D. Estimable functional parameter ( )

8. A random function of X and Θ whose distribution does not depend on Θ is called

   A. Pivot B. Confidence Interval C. Random Variable D. None of the above ( )

9. Let Θ be an unknown parameter T1 be an unbiased estimator of Θ: if $Var(T1) \leq Var(T2)$, for T2 to be ant other unbiased estimator , then t1 is known as : ( )

A. minimum variance unbiased estimator B. unbiased and efficient estimator

C.consistent and efficient estimator Unbiased D. consistent, minimum variance estimator

10. Let E(T1) = ϴ=E(T2), where T1 and T2 are the linear functions of the sample observations .if V(T1) ≤V(T2) THEN:

A.T1 is an unbiased linear function B. T1 is the best linear unbiased estimator ( )

C. T1is a consistent linear unbiased estimator D. T1 is a consistent linear unbiased estimator

SECTION-B (Fill in the Blanks: 10 x ½ = 5 Marks)

1. Any population Constants is called a ____________________
2. What is the statistic ______________.
3. Optimum allocation is also known as ____________________ allocation.
4. Estimator of population total lr y ^ = ____________________
5. Under PPS selection a unit has ________________ chance of being included in the sample than a unit smaller.
6. The process of making decisions about either the form of distribution or parameters involved in it, on the basis of observed sample data set is called ________________________.
7. A statistic which is a function of all other sufficient statistics for ϴ is called ____ ________.
8. A statistic whose values are sufficiently close to the true value of parameter to be estimated with high probability is called ____________________ estimator.
9. ______________ estimation consists of choosing a value that maximizes the likelihood function for a fixed sample data.
10. A functional parameter for which there exists no statistic that is unbiased is called ____________________.

SECTION-C (10x1=10 Marks)

(Answer the following questions in the order only)

1. Find Number of possible samples of size 2 from a population of 4 units under SRSWOR method.
2. Define of simple random sampling Sampling s
3. Give the Ratio estimator of population total Y.
4. What is the sufficient statistic.
5. Statement of Hurwitz – Thomson estimator.
6. State Neyman Factorization Theorem
7. State Rao – Blackwell Theorem
8. Give two properties of MLE
9. Define consistent estimate.s
10. Define CAN estimator.