INTERNAL ASSIGNMENT QUESTIONS
M.Sc. STATISTICS PREVIOUS

ANNUAL EXAMINATIONS
June / July 2018

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)

DIRECTOR
Prof. C. GANESH
Hyderabad – 7 Telangana State

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 **submit Internal Assignment Answer Script along with Examination Fee Receipt** at the concerned counter on or before **15th June, 2018**

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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.

FORMAT

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 **15th June, 2018** at the concerned counter at PGRRCDE, OU on any working day and obtain receipt.

Prof. C. GANESH
DIRECTOR

M.Sc. STATISTICS - PREVIOUS

CDE - ASSIGNMENT - 2018

Paper-I : MATHEMATICAL ANALYSIS & LINEAR ALGEBRA

I. 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) $\leq$ d) $\geq$ (   )

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) $\geq$ c) $<$ d) $\leq$ (   )

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

   a) f ε R(α) 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) ( )

II. 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 $a = x_o < x_1 < x_2 < \ldots\ldots\ldots\ldots < x_n = b$, then the set of points $P = \{ x_o, x_1, x_2, \ldots, x_n\}$ 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.

III. 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. STATISTICS - PREVIOUS
CDE - ASSIGNMENT - 2018
PAPER- II : PROBABILITY THEORY

I. 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. 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

b) Lianpunov's inequality

c) Triangular inequality

d) Minkowski's inequality

i) $E(|X+Y|^p)^{1/p} \leq (E|X|^p)^{1/p} (E|Y|^p)^{1/p}$

ii) $E(|XY|) \leq (E|X|^p)^{1/p} (E|Y|^q)^{1/q}$, $p > 1$

iii) $E(|X|^r)^{1/r} \leq (E|X|^p)^{1/p}$, $r > p > 0$

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 Characteristic functions

a) Binomial

b) Geometric

c) Cauchy

d) Laplace

i) $p(1-qe^{it})^{-1}$

ii) $(q + p e^{it})^n$

iii) $\exp(-|t|)$

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 ( )

II. Fill in the blanks. Each question carries half Mark.

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.

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

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.

FACULTY OF SCIENCE

M.Sc. (STATISTICS) CDE PREVIOUS, INTERNAL ASSESMENT, MAY 2018

PAPER-III : DISTRIBUTION THEORY & MULTIVARIATE ANALYSIS

Time: 60 Min **Max. Marks:20**

Name of the Student__________________________________ Roll No:___________

Note: Answer Section-A & B on the Question paper by taking print. Answer the questions in Section C in the order 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) $(2\pi)^{-p/2} |\Sigma|^{-½} e^{-½ (\underline{X}-\underline{\mu})' \Sigma^{-1} (\underline{X}-\underline{\mu})}$

   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) $(2\pi)^{-p/2} |\Sigma|^{-½} e^{-½ (\underline{X}-\underline{\mu})' \Sigma^{-1} (\underline{X}-\underline{\mu})}$ b) $(2\pi)^{-np/2} |\Sigma|^{-½} e^{-½ (\underline{X}-\underline{\mu})' \Sigma^{-1} (\underline{X}-\underline{\mu})}$

   c) $(2\pi)^{-np/2} |\Sigma|^{-n/2} e^{-½ (\underline{X}-\underline{\mu})' \Sigma^{-1} (\underline{X}-\underline{\mu})}$ 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 $f(\underline{\boldsymbol{x}})$ =__________________
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.

M.Sc. STATISTICS - PREVIOUS

CDE - ASSIGNMENT - 2018

: SAMPLING THEORY & THEORY OF ESTIMATION

I. 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. In stratified random sampling with optimum allocation, n_h is large if stratum variability S_h is

a) zero b) small c) large d) none of the above ( )

2. In two-stage sampling with equal first stage units, variance of sample mean per second stage units is given by

a) $\left(\frac{1-f_1}{n}\right)+\left(\frac{1-f_2}{m}\right)$ b) $\frac{S_b^{\ 2}}{n}(1-f_1)+\frac{S_w^{\ 2}}{nm}(1-f_2)$

c) $\frac{S_b^{\ 2}}{n}(1-f_1)+(1-f_2)$ d) None of the above ( )

3. In PPSWOR, Horwitz-Thomson estimator of population total 'Y' is defined by

a) $\sum_{i=1}^{N}\frac{Y_i}{P_i}$ b) $\sum_{i=1}^{n}\frac{y_i}{P_i}$ c) $\sum_{i=1}^{n}\frac{y_i}{\pi_i}$ d) None of the above ( )

4. PPSWOR is ________________ efficient than PPSWR.

a) more b) less c) equally d) None of the above ( )

5. The errors arising at the stages of ascertainment and processing of data are termed as

a) Sampling errors b) group A errors c) Non-sampling errors d) None ( )

6. If $T_1(x)$ and $T_2(x)$ be two unbiased estimators of θ, $E(T_1^2(x)) < \infty$ and $E(T_2^2(x)) < \infty$, then efficiency of $T_1(x)$ relative to $T_2(x)$ is denoted by 'e' and is defined as

a) $e=\frac{V(T_2(x))}{V(T_1(x))}$ b) $e=\frac{V(T1(x))}{V(T_2(x))}$

c) $e=V(T_2(x))-V(T_1(x))$ d) $e=V(T_2(x))+V(T_1(x))$ ( )

7. In Cramer – Rao inequality Var(T(x)) ≥ …………….

a) $(\psi(\theta))^2 / I_x(\theta)$ b) $(\psi^1(\theta))^2 / I_x(\theta)$ c) $I_x(\theta) / (\psi(\theta))^2$ d) $I_x(\theta) / (\psi^1(\theta))^2$ ( )

8. Let $x_1, x_2, \ldots, x_n$ be a random sample from $P(\lambda)$ population. Method of moment estimator of λ is

a) $\frac{\bar{x}}{n}$ b) $n\bar{x}$ c) $\bar{x}$ d) $\bar{x}+n$ ( )

9. Confidence interval for chebychev's inequality is given by T(x) $\pm$ ……………..

a) $E(E(T(x))+\theta)^2$ b) $E(E(T(x))-\theta)^2$ c) $E\sqrt{(E(T(x)+\theta)^2}$ d) $E\sqrt{(E(T(x)-\theta)^2}$ ( )

10. Rosenblatt's naïve estimator, optimum band width h_n is given by

a) $\left(\frac{C_1}{4C_0}\right)^{1/5} n^{-1/5}$ b) $\left(\frac{C_1}{4C_0}\right)^{1/5} n^{+1/5}$ c) $\left(\frac{C_0}{4C_1}\right)^{1/5} n^{-1/5}$ d) $\left(\frac{C_0}{4C_1}\right)^{1/5} n^{+1/5}$ ( )

II. Fill in the blanks. Each question carries half Mark.

11. SRSWOR is the technique of selecting a sample in such a way that each of the ${}^{N}C_n$ sample has an equal probability ______________________________ of being selected.
12. The approximate variance of the ratio estimator of population total is given by _______________.
13. The linear regression estimate of population total is given by _______________________.
14. The relationship between S^2, S_b^2 and S_w^2 is given by S^2 = ___________________________ .
15. In PPSWOR, the estimate of Yates and Grundy form of variance of Y_{HT} = ______________________.
16. Statistic is a function of _________________________ observations.
17. A sufficient statistics for θ in a U[0, θ] distribution is _________________________.
18. Jackknife and Bootstrap are known as _____________________________ techniques.
19. MLE's are __________________________________ estimators.
20. {f_n(x) ; n $\geq$1} is said to be asymptotically unbiased if, for every x and f(x), $\underset{n\to\infty}{Lim} E_F f_n(x)$ ____________________________________ $f(x)$.

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

21. Define ratio estimator in stratified random sampling.
22. Define regression estimator in simple random sampling.
23. Define cluster sampling with an example.
24. Define sub-sampling with an example.
25. Define PPSWOR and PPSWR.
26. Explain Rao-Blackwellization.
27. Explain Bootstrap method.
28. State the properties of ML estimator.
29. Define CAN and BAN estimators.
30. Describe Shortest – length CI estimation method.