INTERNAL ASSIGNMENT QUESTIONS
M.Sc. (STATISTICS) PREVIOUS

2024

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

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

Dear Students,

The student appearing for backlog exams of M.Sc. Statistics (Previous) under year-wise scheme and paying examination fee for the first time has to write and submit **Assignment** for each paper compulsorily. Each assignment carries **20 marks.** The marks awarded to the students will be forwarded to the Examination Branch, OU for inclusion in the marks memo. If the student fail to submit Internal Assignments before the stipulated date, the internal marks will not be added in the final marks memo under any circumstances. The assignments will not be accepted after the stipulated date. **The students who paid examination fee and appeared for annual exams in 2023 (or) paid examination fee and not appeared for annual examinations in 2023 are not permitted to submit the assignment now.**

Candidates are required to submit the Exam fee receipt along with the assignment answers scripts at the concerned counter on or before **29.06.2024** and obtain proper submission receipt.

ASSIGNMENT WITHOUT EXAMINATION FEE PAYMENT RECEIPT (ONLINE) WILL NOT BE ACCEPTED

Assignments on Printed / Photocopy / Typed will not be accepted and will not be valued at any cost. Only HAND WRITTEN ASSIGNMENTS will be accepted and valued.

Methodology for writing the Assignments (Instructions) :

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

6. Write the above said details clearly on every subject assignments paper, otherwise your paper will not be valued.
7. Tag all the assignments paper wise and submit them in the concerned counter.
8. Submit the assignments on or before **29.06.2024** at the concerned counter at PGRRCDE, OU on any working day and obtain receipt.

DIRECTOR

Mat paper - I (previous)

Name of the Candidate............ Roll No:.................................

Sign of the invigilator:.................. Time:

I. Select the correct alternatives out of given ones **$10\times1/2=5$**

1. the absolute value or modulus of a complex number a+bi is defined as |a+bi| =...
a) sqrt(a^2+b^2) b) sqrt(a^2-b^2) c) sqrt(a+b) d) sqrt(a - b)

2. Let A be an ($m\times n$) matrix. If a matrix A^+ exists that satisfies
a) AA^+ is symmetric b) A^+A is symmetric c) AA^+A d) all

3. if the system AX=b has one or more solution, then the system is called
a) consistent b) Inconsistent c) unique solution d) all

4. if λ is a characteristic root of a non-singular matrix A then $1/\lambda$ is a characteristic root of...
a) A^{-1} b) A^{1} c) $1/A^{-1}$ d) all

5. A Q.F. Y'BY is said to be congruent to another Q.F. X'AX if the matrix B is Congruent to the matrix
a) Matrix A b) Matrix B c) matrix A^{-1} d) All

6. Every matrix A is congruent to itself, since....
a) A= I'AI b) A c) AI d) I'A

7. let X'AX be a Q.F. in n-variable $x_1, x_2, \dots x_n$ with rank r =s=n then
a) positive definite b) negative definite c) semi positive definite d) all

8. let X'AX be a Q.F. in n-variable $x_1, x_2, \dots x_n$ with rank r < n, and s= r then
a) positive definite b) negative definite c) positive semi definite d) all

9. for any two ($n\times1$) real column vector X and y, we have
a) $(X'Y)^2 \leq (X'X)(Y'Y)$ b) $(X'Y)^2 \leq (X'X)(Y'Y)$
c) $(X'Y)^2 \leq (X'X)(Y'Y)$ d) all

10. if A & B are two symmetric matrices, such that the root of the equation $|A-\lambda B| = 0$ are all distinct, then there exists a matrix P such that P'AP and P'BP are....
a) Both are diagonal b) Both are not diagonal
c) P'AP is diagonal d) P'BP is diagonal

II. Fill the suitable word in the blanks **$10\times1/2=5$**

1. A function f is said to be continuous at a point x=c, if........................
2. Assume $c\varepsilon(a,b)$. if two of the three integral in (1) exist, then the third also exist and we have.........................

3. We say that f satisfies Riemann,s conditions w.r to α on [a,b] if, for every $\varepsilon > 0$, there exists a partition $P\varepsilon$ such that $P \geq P\varepsilon$ implies................
4. The function f is said to be differentiable at the point x=c if te increment $\Delta f(c) = f(c+h)- f(c)$, at x=c , can be expressed by ....
5. A vector X whose length is one is called a ....or...........
6. Every square matrix A satisfies its...............................equation.
7. Let AX=b be a system of non-homogeneous equations then A^{-1}=..............
8. The necessary and sufficient condition for a linear transformation X=PY to preserve length is that ....
9. If, the vectore X=(2,4,4)' then, te normal vector, Z=X/||X||=...........
10. The M.P inverse of A' is equal to A. that is $(A^{+})^{+}$=................

III. write the answers for following questions **10×1=10**

1. Evaluate $\text{Lim}((x^2.1)/(x-1))$.
2. State and prove Reimann-Stieltjes Integral
3. Find the value of $\int_0^2 x^2 d([x] - x)$
4. State and Prove Mean Value theorem for two variable functions.
5. State and prove Couchy's theorem
6. Write step by step procedure of Moore-Penrose inverse Method
7. Write step by step procedure of generalized inverse of matrix
8. State and prove Caley-Hamilton theorem
9. State and prove necessary and sufficient conditions of quadratic form Q=X'AX
10. State and prove Couchy Schwartz Inequality

paper – II (Previous)

Name of the Candidate........... Roll No:................................

Sign of the invigilator:................. Time:

I. Select the correct alternatives out of given ones **10×1/2=5**

1. statistical definition of probability is developed by
   a) R.Von Mises b) pearson c) Laplace d) Bernouli

2. if A and b are mutually exclusive events and P(A).P(B) > 0, then A and B are...
   a) disjoint b) independentc) not independent d) all

3. Let X be a Binomial *r v with probability of success as p* and $p(x,p) = p^x(1-p)^{n-x}$, x=0,1,2... then E(X)=
   a) npp b)q c) np d) nq

4. let (X,Y) be a two dimensional *r v.* if the conditional expected values E[Y/X = *y*] and E[X/Y = *x*] exist, then E[E(X/Y = *y*)]=
   a)E(X) b)E(Y) c) E[X/Y] d) E[Y/X]

5. let X have a poisson distribution with parameter μ then probability generating function (PGF)of X
   a) $p(S)=e^{-\mu+\mu s}$ b) $p(S)=e^{\mu-\mu s}$ c) $p(S)=e^{+\mu s}$ d) $p(S)=e^{\mu+\mu s}$

6. convergence almost sure implies convergence in.............
   a) in probability b) in Law c) in general d) all

7. let $\{X_n;n\geq1\}$ be a sequence of independent random varailble defind by $P[X_n=-2^n]= P[X_n=+2^n]=$...
   a)1/2 b) -1/2 c) 4^n d) 2

8. the characteristic function of Cauchy distribution is
   a) e^{-t} b)$e^{-|t|}$ c)e^{-t} d)$e^{-|t\mu|}$

9. let X be a random variable and *f(x)* is convex function of X then $f(E(X))\leq E\{f(X)$ is .....inequality
   a) Liapounov's b) Jensen's c) Chernoff bounds d)Holder's

10. let X and Y be two random variables with $E(X)^2 < \infty$ $E(Y)^2 < \infty$. Couchy schwartz inequality holds....
    a) $[E(XY)]^2 \leq E(X).E(Y)$ b) $[E(XY)]^2 \leq E(X)^2.E(Y)^2$
    c) $[E(XY)]^2 \geq E(X).E(Y)$ d) $[E(XY)]^2 \geq E(X)^2.E(Y)^2$

II. Fill the suitable word in the blanks **10×1/2=5**

1. Mathematical definition of probability is developed by................
2. Suppose A and B are two independent events then $P(A\cap B)$ = ...

3. The *cdf* $F(X)$ of a *r.v* X is pure jump function (or step function) then the *r.v* X is called.........
4. Let X be a random variable with *pdf* $f(x)$. if x=c, where c is constant, then E(X)=.........
5. If X is a random variable that takes only non-negative values, then for any value $a > 0$. $P[X \geq a] \leq$..........
6. Let $X_1,X_2,X_3,.....X_n$ be a random sample from $N(\mu,\sigma^2)$, then mean of X follows.........
7. Let $\{X_n;n\geq 1\}$ be a sequence of i.i.d *r.v.s* with $E(X_1) = \mu < \infty$ then this sequence of WLLN's called..............
8. Let $\{\{X_n;n\geq 1\}$ be a sequence of i.i.d Bernouli *r.v.s* defind as $P[Xn =1\}=p$ and $P[Xn=0]=1-p=q$ for all $n\geq 1;0<p<1$. Then...........
9. Chapman-kolmogorov equation for two states I and j in S, and any two positive integers m and n, then $p_{ij}^{(m+n)}=$ ....
10. A recurrent state i belongs to S is called a null-recurrent state if μ_i equals to...............

III. write the answers for following questions **10×1=10**

1. If P(A)= 0.9, P(B)= 0.8 show that $P(A\cap B) \geq 0.7$.
2. Let X be a normally distributed *r.v* with parameters μ and σ^2. Find the expected value of the variate $h(X)= \frac{1}{2}.X-5$.
3. If X and Y are any two *r.v's* and $U=a_1X + b$, $V=a_2Y+b$, then find Cov(U,V).
4. State chebyshev's Inequality.
5. Let X be a Bernouli *rv* with probability of success *p*. find characteristic function of X.
6. Let $\{X_n, n=1,2,...\}$ be a sequence of *rv's*, define Convergence almost surely.
7. Define Weak law of large numbers (WLLNs).
8. State Borel's Srong Law of Large Numbers
9. Write statement of Bayes theorem.
10. Define Positive Recurrent state and Null recurrent state.

FACULTY OF SCIENCE

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

PAPER-III : DISTRIBUTION THEORY & MULTIVARIATE ANALYSIS

Time: 60 Min **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) $(2\pi)^{-p/2}\, |\Sigma|^{-1/2}\, e^{-\frac{1}{2}(\underline{X}-\underline{\mu})'\Sigma^{-1}(\underline{X}-\underline{\mu})}$

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

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+2λ) 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 $\underline{X} \sim N_P(\mu, \Sigma)$ then the distribution of sample mean vector $f(\underline{x})$ =________________
10. If $\underline{X} \sim N_P(\mu, \Sigma)$, 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.

P.T.O.

FACULTY OF SCIENCE
M.Sc. (STATISTICS) I- Year PGRRCDE May 2023
INTERNAL ASSESSMENT
PAPER- IV: Sampling Theory and Theory of Estimation
Name of the Candidate: -------------------------------------- Roll No. ---------------------

Section-A (10 x ½ = 5)

1. A confidence interval of confidence coefficient (1 - α) is best which has ?

   a) Smallest width b) vastest width

   c) upper and lower limits equidistant from the parameter d) one-sided confidence interval.

2. The maximum likelihood estimators are necessarily?

   a) unbiased b) sufficient c) most efficient d) unique

3. For a random sample from a Poisson population P (λ), the maximum likelihood estimate of λ is?

   a) Median b) mode c) geometric mean d) mean

4. An estimator of a parametric function τ (θ) is said to be the best if it possesses?

   a) Any properties of a good estimator b) at least three properties of a good estimator

   c) all the properties of a good estimator d) all the above

5.For an estimator to be consistent, the unbiasedness of the estimator is?

   a) Necessary b) sufficient

   c) necessary as well as sufficient d) neither necessary nor sufficient

6.Factorization theorem for sufficiency is known as?

   a) Crammer - Rao Theorem b) Rao-Blackwell Theorem

   c) Chapman-Robbins Theorem d) Fisher-Neyman Theorem

7. Bias of an estimator can be?

   a) negative b) positive c) either positive or negative d) always zero

8. If the sample mean $\bar{X}$ is an estimate of population mean μ, then $\bar{x}$ is?

   a) unbiased and inefficient b) unbaised and efficient

   c) biased and efficient d) biased and inefficient

9.If T_n and T_n^* are two unbiased estimators of $\tau(\theta)$ based on the random sample $X_1, X_2, \ldots, X_n$, then T_n is said to be UMVUE if an only if?

a) $V(T_n) \geq V(T_n^*)$ b) $V(T_n) \leq V(T_n^*)$

c) $V(T_n) = V(T_n^*)$ d) $V(T_n) = V(T_n^*) = 1$

10. Mean squared error of an estimator T_n of $\tau(\theta)$ is expressed as ?

a) $[\text{bias} + \text{var}_\theta\ (T_n)]^2$ b) $\text{bias} + \text{var}_\theta\ (T_n)$ c) $[(\text{bias})^2 + \text{var}_\theta\ (T_n)]^2$ d) $[(\text{bias})^2 + \text{var}_\theta\ (T_n)^2$

Section-B (10 x ½ = 5)

1.Neyman – Pearson lemma is used to find the best critical region for testing........

2.. Probability of Type I error is known as.......

3. A hypothesis is true, but is rejected, this is an error of type......

4. A hypothesis is false, but accepted, this is an error of type....

5. If observed value is less than the critical value, the decision is..........

6.. Whether a test is one-sided or two-sided depends on......

7.. In 1933, the theory of testing of hypothesis was propounded by....

8. The ratio of the likelihood function under H_0 and under the entire parametric space is called?

9. Testing $H_0 : \theta = 200$ vs $H_1 : \theta = 200$ leads to?

10. Critical region of one-sided test for normal distribution 5% risk will be?
a) (-1.645, 1.645) b) (1.645, ∞) c) (-∞, -1.645) or (1.645, ∞)d)(-∞to 1.645)

Section-C (10 x 1 = 10)

1. Definition of CAN and BAN
2. Explain the Method of moments and maximum likelihood method,
3. Explain the Concept of U statistics.
4. State Cramer-Rao inequality and Bhattacharya bounds
5. Explain the Concept of tolerance limits and examples.
6. Explain the properties of a good estimator

7.Explain Confidence intervals for the parameters for Normal, Exponential distribution

8 Explain the Cumulative total and. Lahiri's methods

9 Explain the sampling errors and non-sampling errors

10.Compare PPSWOR AND SRSWOR