INTERNAL ASSIGNMENT QUESTIONS
M.SC. STATISTICS PREVIOUS
ANNUAL EXAMINATIONS
(2015-2016)

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. H.VENKATESHWARLU

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 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. 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. The assignment marks will not be accepted after the stipulated date,

You are required to **pay Rs.300/- fee** towards Internal Assignment marks through DD (in favour of Director, PGRRCDE, OU) and submit the same along with assignment at the concerned counter **on or before 15-07-2016** and obtain proper submission receipt.

ASSIGNMENT WITHOUT THE DD WILL NOT BE ACCEPTED

Assignments on Printed / Photocopy / Typed papers 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:

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 STUDENT :
2. ENROLLMENT NUMBER :
3. M.Sc. (Statistics) Previous :
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 assignment number wise.
8. Submit the assignments on or before **15-07-2016** at the concerned counter at PGRRCDE, OU on any working day and obtain receipt.

Prof.H.VENKATESHWARLU
DIRECTOR

CENTER FOR DISTANCE EDUCATION

M.Sc.- STATISTICS ASSIGNMENT PAPER

Sub: Mathematical Analysis & Linear Algebra (Paper-1) Max Marks: 15

Multiple Choice Questions:(10*1/2=5)

1. If V_f (a,b) ↔ f is
   a) Bounded b)Continuous c)Increasing d)None
2. The Point (x,y) obtained by solving f_x=0 and f_y=0 as known as
   a) Saddle Point b)Extreme Point c)Critical Point d)None
3. A function which is increasing and decreasing is known as
   a) Bounded b) Continuous c) Analytic d)Monotonic
4. A function f is said to be a function of Bounded variation then
   a) $\sum|\Delta f_k|\geq M$ b) $\sum|\Delta^2 f_k|<M$ c) $\sum|\Delta f_k|\leq M$ d) None
5. If f(x,y) has an extreme value in (a,b) then necessary condition os
   a) f_x (a,b)=0 & f_y(a,b)=0 b)) f_x (a,b)=(a,b) c) $f_{x/y}$ (a,b)=0 & $f_{y/x}$(a,b)=0d)None
6. If P is non singular matrix, $P^l BP$=
   a) B b)P c)I_{m*m} b) P^l
7. The length of normal vector is
   a) 0 b)1 c)-1 d)None
8. If $X^l AX>0$ then q is called
   a) Positive definite b) Negative definite c) Semi positive d) Semi Negative
9. If Q= $Y^l DY$ is known as
   a) Signature of Q b)Index of Q c) Diagonal of Q d) None
10. In computation of M-P Inverse $A^l A$=
   a)B b)A c)I b) A^l

Fill in the Blanks: (10*1/2=5)

1. If the function f is monotonic on (a,) then 'f' is _______________ on (a,b)
2. Riemann Integral S(P,f)=_____________
3. Total Variation V_f (a,b) = _____________
4. Δf_k =
5. The Taylor's expansion of f(a+h,b+k)=_____________________________
6. The rank of moore Penrose inverse of A =_____________
7. If H is idempotent then H^2
8. If A is Positive definite then the characteristic roots of A are _________
9. In the Gram Schmidt orthogonalization process the basis Z_k=____________
10. The Moore Penrose inverse is always ________________

Answer the following (10*1=10)

1. Define Extreme and saddle point
2. Define Simultaneous limit
3. Define Repeated limit
4. Define Riemann stielties integral(RS Integral)
5. What is finer partition and give one example
6. Define Quadratic form and index and signature
7. Define orthogonal basis and orthonormal basis
8. Gram Schmidt Orthogonalization process
9. Prove if AX=g is consistent iff $AA^{-l}g=g$
10. Define GramMatrix

FACULTY OF SCIENCE
M.Sc. I Year : APRIL 2016
CDE ASSIGNMENT QUESTIONS
SUBJECT: STATISTICS
PAPER- II: PROBABILITY THEORY

N.B.: Answer all questions.

(a) Give the correct choice of the answer like 'a' or 'b' etc in the brackets provided against the question, Each question carries ½ mark:

1. The inequality $P\{|X_n - \mu| > \varepsilon\} \leq \frac{\sigma^2}{\varepsilon^2}$ is known as ( )

(a) Jensons **(b)** Lyapunov's **(c)** Chebychev's **(d)** Minkovski's

2. The distribution function of a random variable X is given by $F(x) = 1-(1+x)e^{-x}$; for $x \geq 0$ and F(x)=0;otherwise.Then, the probability density function

(a) $(1+x)e^{-x}$ **(b)** $(x-1)e^{-x}$ (c) $(e^{-x}+x+1)$ **(d)** e^{-x} ( )

3. If A,B,C $\in \zeta$ and A and B imply C, then ( )

(a) $p(C^/) \geq p(A^/) + P(B^/)$ (b) $p(C^/) \leq p(A^/) - P(B^/)$

(c) $p(C^/) \geq p(A^/) - P(B^/)$ (d) $p(C^/) \leq p(A^/) + P(B^/)$

4. The characteristic function of Poisson distribution is ( )

(a) $e^{-\lambda(e^{it}-1)}$ (b) $e^{\lambda(e^{it}+1)}$ (c) $e^{\lambda(e^{it}-1)}$ (d) $e^{-\lambda(e^{it}+1)}$

5. If $\beta_n = E|X|^n < \infty$ then for $2 \leq k \leq n$ we have ( )

(a) $\beta_k \leq \beta_{k+1}$ (b) $\beta_k^{1/k} \geq \beta_{k+1}^{k+1}$ (c) $\beta_k^k \leq \beta_{k+1}^{k+1}$ (d) $\beta_k^{1/k} \leq \beta_{k+1}^{k+1}$

6. If a sequence of independent random variables is defined as $P[X_n = -2^n] = \frac{1}{2}$ and $P[X_n = 2^n] = \frac{1}{2}$; n≥ 1 then $E[X_n]$ is ( )

(a) 2^n (b) 2^{n+1} (c) 0 (d) 1

7. If $X_i \sim N(\mu, \sigma^2)$; $i = 1,2,...n$; independently and if $S_n = \sum_{i=1}^{n} X_i$ then $V(S_n) =$ ( )

(a) σ^2 (b) nσ^2 (c) σ^2/n (d) $\sigma / \sqrt{n}$

8. The random variables for which Borels strong law of large numbers is defined are ( )

(a) i.i.d. binomial (b) i.i.d. Poisson (c) i.i.d. Bernoulli (d) i.i.d. normal

9. For the following TPM, when the state space is S={0,1,2}then the absorbed state is

$$P = \begin{bmatrix} 1/3 & 2/3 & 0 \\ 0 & 1 & 0 \\ 1/2 & 0 & 1/2 \end{bmatrix}$$ ( )

(a) 0 (b) 1 (c) 2 (d) none

10. The notation $p_{ij}^{(3)}$ in the Markov chain represents ( )

(a) Probability of reaching the state j from state i in 3 steps
(b) Probability of reaching the state i from state j in 3 steps
(c) Probability of not reaching the state j from state i in 3 steps
(d) Probability of not reaching the state i from state j in 3 steps

(b) Fill up the blanks, Each question carries ½ mark:

1. If $\phi_X(t)$, t$\in R^1$ is a characteristic function of a random variable X then the characteristic function of Z = (X – μ) / σ is ________________ where μ and σ^2 are the mean and variances of X.

2. If a sequence of random variables is convergent in probability then $P(|X_n - X| \geq \varepsilon) \rightarrow$______, as n$\rightarrow \infty$.

3. In terms of Distribution function, P(a$\leq$X$\leq$b) = ____________________

4. If $\{X_n; n \geq 1\}$ is a sequence of Bernoulli random variables such that P$[X_n = 1]$= p and P$[X_n = 0]$= q then $E\left[\frac{S_n}{n}\right]$= ______

5. If $\{X_n; n \geq 1\}$ is a sequence of large numbers such that $S_n = \sum_{i=1}^{n} X_i$, $E[X_i] = \mu_i$ and $V(X_i) = \sigma^2$ then $\frac{S_n}{n} \xrightarrow{p} E\left[\frac{S_n}{n}\right]$ *as* $n \rightarrow \infty$ is known as __________________ WLLN's.

6. According to Chebychev's inequality P($|X - \mu| \geq k$)$\leq$ _____________

7. Bernoulli process is a Stochastic process in which state space is ___________and index set is __________________.

8. The SLLN's which is a particular case of Kolmogorov's SLLN's is ______________________.

9. A positive recurrent and aperiodic state is known as ___________________________ state.

10. $E^{1/2}|X+Y|^2 \leq E^{1/2}|X|^2 + E^{1/2}|Y|^2$ is known as ______________________________ inequality.

Each question carries 1 mark
Answer the following questions within the space provided

1. **Define distribution function and state its properties:-**

2. **State Jensons inequality:-**

3. **Define the mode of convergence in probability:-**

4. **Obtain the characteristic function of Normal distribution.**

5. **State Slutzkys theorem and Borel 0 – 1 law**

6. **State Kolmogorovs SLLN's and Kolmogorovs inequality.**

7. **State Levy – Lindeberg CLT and Khintchines WLLN's.**

8. **In the following TPM, identify the closed class, when the state space is {0,1,2}** $P = \begin{bmatrix} 1/3 & 2/3 & 0 \\ 1/2 & 1/2 & 0 \\ 0 & 1 & 0 \end{bmatrix}$.

9. **If P** $\left[X_k = \pm\sqrt{\log k}\right]$ **=** $\frac{1}{2}$ **; k=1,2,3,…n then obtain V(** X_k **).**

10. **Define Initial distribution of a Markov chain:-**

M.SC. (Statistics) First Year (CDE) Assignment
PAPER-III : Distribution Theory & Multivariate Analysis
(Maximum Marks : 20)

Note: Answer all the questions in A_4 size white papers neatly with your own hand writing in the order of Questions by writing the Question numbers.

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

1. Identify the correct

a) log normal	i) M.D. = 4/5 σ
b) Pareto	ii) (1/c) !
c) Normal	iii) Mean = ak/(a-1)
d) Weibul	iv) Median = exp (μ)

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) None [ ]

2. The Moment generating function does not exists for

a) log normal	i) Mean < Median > Mode
b) Pareto	ii) Mean > Median > Mode
c) Normal	iii) Mean < Median< Mode
d) Weibul	iv) Mean = Median = Mode

a) a-iii, b-ii, c-iv, d-i   b) a-ii, b-i, c-iv, d-iii   c) a-i, b-ii, c-iv, d-iii   d) None [ ]

3. The distributions satisfies the exponential family among i) Binomial ii) Negative Binomial iii) Hyper-Geometric iv) Uniform v) Gamma vi) Cauchy vii) Normal viii) Beta are _____
a) i, ii, iii, iv, v   b) i, ii, iv, v, vii   c) i, ii, v, vii, viii   d) None [ ]

4. Identify the correct for the following distribution and property

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) None [ ]

5. If $A \sim W_P(\Sigma, m)$ $B \sim W_P(\Sigma, n)$ $(m, n \geq p)$ are independent then $|A| / |A+B|$ follows
a) Normal b) Wishat c) Wilks Λ d) None [ ]

6. If $X \sim N_P(\mu, \Sigma)$ then the distribution of sample mean vector follows
a) $N_P(n\mu, n\Sigma)$ b) $N_P(\mu/n, \Sigma/n)$ c) $N_P(\mu, \Sigma/n)$ d) None [ ]

7. If $X \sim N_P(\mu, \Sigma)$, and consider a linear transformation $Y^{(1)} = X^{(1)} - \Sigma_{12}\Sigma^{-1}_{22}X^{(2)}$, $Y^{(2)} = X^{(2)}$ with Covariance $(Y^{(1)}, Y^{(2)})$ is ______________.
a) $\Sigma_{12}\Sigma^{-1}_{22}\Sigma_{21}$ b) $-\Sigma_{12}\Sigma^{-1}_{22}\Sigma_{21}$ c) $-\Sigma_{12}\Sigma^{-1}_{22}$ d) zero [ ]

8. The maximum percentage of explained principal component for a data whose a variance-covariance matrix eigen values are 6, 3.9 and 0.1 is
a) 60% b) 39% c) 1% d) None of these [ ]

9. The process of obtaining the geometric representation of multidimensional scaling based on the ordinal information is said to be __________ Multidimensional Scaling.
a) Metric b) Non-metric c) Parametric d) None of these [ ]

10. The mean of sample of p-variate normal distribution is ________________
a) Normal b) t- c) wishart d) None of these [ ]

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

11. If X & Y follows Standard Normal then the ratio of X and Y follows _________ variate.
12. The sum of two independent Exponential variate U (=X+Y) is ______________ .
13. If X follows a Chi-square with n_1 df and Y also follows chi-square with n_2 df independently then the ratio of two chi-squares X/Y is _________________ variate.
14. The ratio of two standard normal distributions is follows _________________________
15. The probability density function of Compound Binomial-Poisson distribution is ________
16. The Expected Cost for Misclassification (ECM) is defined as __________________.
17. The concept of maximum likelihood discriminant rule is ________________________.
18. The objective of canonical correlation analysis is to find X* = a′X and Y* = b′Y so that _________ is maximum.
19. If the density function is $f(\mathbf{x}) = ½\exp\{-½\{(x_1-1)^2+(x_2-2)^2\}\}$ then covariance Σ is _____
20. The coefficients of $(t_1^2/2!)$ and $(t_2^2/2!)$in the CGF of Multinomial are______________

SECTION-C (10 x 1 = 10)

21. Obtain the mean of standard Weibull distribution.
22. If X follows Lognormal distribution then derive the distribution of 1/X.
23. Express the Poisson as a Power series distribution.
24. Derive the Mean & Variance of conditional distribution of Bivariate normal.
25. State the Assumptions on Orthogonal Factor Model.
26. State the Fishers discriminant allocating rule for assigning X to Populations π_1 or π_2.
27. State the assumptions in deriving the Canonical variables and its correlations
28. Explain Metric method of Multidimensional Scaling
29. State the applications of Hotelling T^2.
30. If $X \sim N_3([4 \ \ 5\ ]$, $\Sigma = \begin{bmatrix} 12 & 8 \\ 8 & 9 \end{bmatrix}$ then the density of bi-variate normal.

M.Sc. (PREVIOUS) STATISTICS - CDE
INTERNAL ASSIGNMENT MAY 2016
SUBJECT : STATISTICS
Paper-IV : Sampling Theory & Theory of Estimation

Marks:20

N.B.: Answer all Questions.

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. SRSWOR is always ___________ efficient than SRSWR.
   a) less   b) equally
   c) more   d) None of the above   (   )

2. In optimum allocation of stratified random sampling, n_h is large if stratum variability S_h is _____________.
   a) large   b) small
   c) zero   d) None of the above   (   )

3. In ppswr, the unbiased estimator of V($\hat{Y}_{pps}$) is
   a) $\frac{1}{n}\sum_{i=1}^{n}(\frac{y_i}{p_i}-\hat{Y}_{pps})^2$ b) $\frac{1}{n(n-1)}\sum_{i=1}^{n}(\frac{y_i}{p_i}-\hat{Y}_{pps})^2$
   c) $\frac{1}{n-1}\sum_{i=1}^{n}(\frac{y_i}{p_i}-\hat{Y}_{pps})^2$ d) None of the above   (   )

4. Bias of $\hat{R}$ is of the order
   a) $\frac{1}{2n}$ b) $\frac{1}{n}$
   b) $\frac{1}{\sqrt{n}}$ d) None of the above   (   )

5. V($\bar{y}_{lrs}$) is minimum if $b_h = B_h$ = _________
   a) $\frac{S_{yh}^2}{S_{xh}^2}$ b) $\frac{S_{xh}^2}{S_{yh}^2}$
   c) $\frac{S_{yxh}}{S_{xh}^2}$ d) None of the above   (   )

6. The ________ estimation consists of constructing two statistics L(x) and U(x) based on sample 'x' such that for any population feature 'θ', L(x) ≤ U(x) and P[L(x) ≤ θ ≤ U(x)] = 1-α.

   a) point   b) interval   c) simple   d) None of the above   (   )

7. A random function $T(x) : S^n \rightarrow \Omega$ is said to be _________ estimator of $\Psi(\theta)$, if for any positive integer 'n', $E_\theta [T(x)] = \Psi(\theta)$, for all $\theta \in \Omega$.

a) mean unbiased b) median unbiased c) unbiased d) None of the above ( )

8. _________ developed to establish the lower bound for the variance of any unbiased estimator of parametric function $\Psi(\theta)$.

a) Bhattacharya b) Rao-Blackwell c) Fretcht-Cramer Rao d) None of the above ( )

9. The two important resampling techniques are __________.

a) Bootstrap b) Jacknife c) Reduction in bias d) None of the above ( )

10. When $f_n(x)$ is defined as the ratio of the relative frequency divided by the length of the interval, then the estimator is due to ________.

a) Kernel type b) Rosenblatt's c) non-parametric d) None of the above ( )

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

1. In Stratified Random Sampling, the population is ___________________________.

2. In Systematic sampling, $V(\bar{y}_{sys})$ = _________________________ .

3. If the total sample size 'n' is large then $V(\hat{Y}_{RC})$ = ___________________________ .

4. In cluster sampling, the relationship between S^2, S_b^2 and S_w^2 is S^2 = ____________.

5. In two-stage sampling, 'n' first stage units and 'm' second stage units from each chosen first stage units are selected by SRSWOR then its sampling variance is given by $V(\bar{y})$ = ___________________________.

6. The concept of completeness was introduced by ______________________.

7. For unknown parameter θ which maximizes the likelihood function for variation in θ, $L(x;\hat{\theta}) = \underset{\theta \in \Omega}{Sup}$ L(x,θ), $\hat{\theta}$ is called _______________________________________.

8. Asymptotic Related to Efficiency can be defined as __________________________.

9. Two methods for finding confidence intervals are ____________________________.

10. The end points of a tolerance interwal are called _____________________________.

Write short answers :-

1. Define ratio estimator and regression estimator.
2. Define ppswor and ppswr.
3. Define cluster sampling and two –stage sampling . Give an example for each.
4. Define non-samplng errors.
5. Explain about non-sampling bias.
6. State and prove Neyman Factorization theorem.
7. Define Fisher information.
8. Write the statements of Rao-Blackwell and Battacharya bounds.
9. Define CAN and BAN estimators.
10. Define Rosenblatt's native and Kernel-type density estimators.