

**INTERNAL ASSIGNMENT QUESTIONS  
M.Sc. (Statistics) I SEMESTER**

**2026**



**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. N.Ch. Bhattacharyulu  
Hyderabad – 7 Telangana State**

*Hyderabad*

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

Dear Students,

Each student has to write the answers to the Assignment questions with neat own handwriting using **BLUE PEN** (Black Ink not allowed) for each paper. Assignments have to submit after the payment of Rs.500/- by showing the receipt of the same. If the Assignment is not submitted within stipulated time i.e. before the theory exams / last date is treated as absent.

**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. SEMESTER ( I, II, III & IV ) :
  5. TITLE OF THE PAPER :
  6. 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 **30<sup>th</sup> May, 2026** at the concerned counter at PGRRCDE, OU on any working day and obtain receipt.

**Note : Write the Answers in A4 size white papers with Blue ink / ball point pen only**

  
**DIRECTOR**

**PROF G. RAMREDDY CENTRE FOR DISTANCE EDUCATION  
OSMANIA UNIVERSITY, HYDERABAD-7.  
COURSE: M.SC. (STATISTICS)**

**Write the Answers in A4 size white papers with blue ink/point pen only**

**PAPER-I: MATHEMATICAL ANALYSIS & LINERA ALGEBRA**

**Note: Answer all the following questions**

**Section-A (5 x 2 =10)**

1. Define Jacobian function of n variables. If  $x^2+y^2+u^2-v^2=0$  and  $uv+xy=0$ , find the Jacobian of transformation and the derivatives  $x$  y u and  $\partial u/\partial x$ ,  $\partial v/\partial y$ .
2. If u,v,w are the roots of the cubic in  $\lambda$  and  $(\lambda-x)^3+(\lambda-y)^3+(\lambda-z)^3 = 0$  then prove that 
$$\frac{\partial(u,v,w)}{\partial(x,y,z)} = -2 \frac{(y-z)(z-x)(x-y)}{(v-w)(w-u)(u-v)}$$
3. Define analytic function, Cauchy residue theorem, Taylor's theorem and Laurents theorem.
4. What do you understand by inverse of matrix, by defining it and how do you evaluate the inverse for a rectangular matrix or singular matrices. Write its significant applications in statistical theory.
5. What do you understand by Eigen value and eigen vector. Write its significant properties. Also write any five real time applications of those.

**Section-B (10 x 2 =10)**

6. Write in detail the following
  - (i) Assume that  $\alpha$  increasing on  $[a,b]$ . If  $f \in R(\alpha)$  on  $[a,b]$ , then  $f^2 \in R(\alpha)$  on  $[a,b]$
  - (ii) State and prove the Cauchy-residue Theorem.
7. State and prove Cauchy-Schwartz and Hadamard inequalities for matrices. Write any two real time applications of these inequalities

**PROF G. RAMREDDY CENTRE FOR DISTANCE EDUCATION  
OSMANIA UNIVERSITY, HYDERABAD-7.  
COURSE: M.SC. (STATISTICS)**

**Write the Answers in A4 size white papers with blue ink/point pen only**

**Note: Answer all the following questions**

**PAPER-II: PROBABILITY THEORY**

**Section-A (5 x 2 =10)**

1. Write the importance and need of study of characteristic function?
2. Evaluate density function of random variable X whose characteristic function is  $\phi_X(t) = (1+t^2)^{-1}$ .
3. Evaluate  $E[E[X/Y]]$  for a distribution with joint density  $f(x,y) = 8xy$   $0 < x < y < 1$ .
4. State and prove Slutsky's theorem
5. Let  $\{X_n, n \geq 1\}$  be an independent and identically distributed sequence of random variables with density  $f(x) = \frac{1}{\pi(1+x^2)}$ , then examine whether the sequence holds central limit theorem?

**Section-B (10 x 2 =20)**

- 6 (i) Let  $\{X_n; n \geq 1\}$  be a sequence of r.v.'s with  $P[X_n = \pm 2^{\frac{1}{n}}] = \frac{1}{2}$ . Examine whether the sequence holds convergence in almost sure and quadratic mean convergences?  
Examine whether the sequence holds strong and weak law of large numbers  
(ii) Discuss the various central limit theorems and distinguish one with another.
7. State various Probability inequalities and write the inter-relationships among one another. Also write at least four applications on each.

**PROF G. RAMREDDY CENTRE FOR DISTANCE EDUCATION  
OSMANIA UNIVERSITY, HYDERABAD-7.  
COURSE: M.SC. (STATISTICS)**

**Write the Answers in A4 size white papers with blue ink/point pen only**

**Note: Answer all the following questions**

**PAPER-III: DISTRIBUTION THEORY**

**Section-A (5 x 2 =10)**

1. Let  $X$  be a random variable satisfies the distribution function  $F(x) = 1 - (1+x) e^{-x}$  ; for  $x \geq 0$  and  $F(x)=0$ ; otherwise. Then evaluate the its probability mass/ density function if exists?
2. State and derive exponential family of distributions for Binomial, Poisson and Exponential distribution.
3. Write the step-by-step procedure of obtaining the distributions of functions of random variables using the method of Jacobian transformation
4. Define Sampling distributions and discuss its need and how these are different from the parental distributions.
5. Write any five applications and usages of Order Statistics in statistical theory.

**Section-B (10 x 2 =20)**

6. If  $X$  and  $Y$  are two chi square variates with  $n_1$  and  $n_2$  degrees of freedom then obtain the distributions of  $u = X+Y$ ,  $v = X/Y$  and  $z = X/(X+Y)$
7. Write the real time any five applications on each of Log-normal, Weibull, Pareto and Cauchy distributions and also write their significance.

## **Paper-IV: ESTIMATION THEORY**

**Section – A (5 × 2 = 10 marks)**

**Answer the following questions.**

1. Explain the concept of the criteria of "sufficiency" and "efficiency" of estimates of parameters. Write their properties and illustrate each with suitable examples.
2. What is a UMVU estimator And Fisher Information? How do they help us choose the best estimator in real life
3. Define CAN and BAN estimators. What conditions make an estimator BAN, and how do these estimators relate to asymptotic efficiency in large samples
4. What are Median Unbiased Estimators and Model Unbiased Estimators? How are they different from each other?
5. Explain Bootstrap method of estimation? Explain with suitable example.

**Section – B (2 × 10 = 20 marks)**

**Answer the following questions**

1. State and prove the Cramér–Rao inequality. Illustrate it with suitable examples.
2. State and prove the Lehmann–Scheffé Theorem. Provide a real-life example to illustrate its application in statistical estimation.