INTERNAL ASSIGNMENT QUESTIONS
M.Sc. (Mathematics) SEMESTER I

2025

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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Hyderabad – 7 Telangana State

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

Dear Students,

Every student of M.Sc. (Mathematics) Semester I has to write and submit **Assignment** for each paper compulsorily. Each assignment carries **30 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. **Candidates should submit assignments only in the academic year in which the examination fee is paid for the examination for the first time.**
Candidates are required to submit the Exam fee receipt along with the assignment answers scripts at the concerned counter on or before **25.07.2025** 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.

Students are advised not to use Black Pen.

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 **25.07.2025** at the concerned counter at PGRRCDE, OU on any working day and obtain receipt.

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INTERNAL ASSIGNMENT QUESTION PAPER

COURSE: M. Sc., (MATHEMATICS) – I - Semester

Paper: I **Subject: Abstract Algebra**

Section – A

Answer the following short questions (each question carries two marks) ($5 X 2 = 10M$)

1. Prove that a group G is solvable if and onlu if G has a normal series with abelian factors. Further, a finite group is solvable if and onlu if its composition factors are cyclic groups of prime orders.

2. Let G be a nilpotent group. Then prove that every subgroup of G and every.homomorphic image of G are nilpotent.

3. Let G be a group of order108. Show that there exists a normal subgroup of order 27 or 9.

4. If R is a nonzero ring with unity1, and I is an ideal in R such that $I \neq R$. Then prove that there exists a maximal ideal M of R such that $I \subseteq M$.

5. Let R be a UFD, and let S be a multiplicative subset of R containing the unity of R. Then prove that R_s is also a UFD.

Section – B

Answer the following questions (each question carries five marks) ($2X10 = 20M$)

1. Let A be a finitely generated abelian group. Then prove that A can be decomposed as a direct sum of a finite number of cyclic groups C_i. Precisely, $A = C_1 \oplus C_2 \oplus \ldots \oplus C_k$, such that either $C_1, C_2 \ldots C_k$ are all infinite, or for some $j \leq k$, $C_1, C_2 \ldots C_j$ are of order $m_1, m_2, \ldots m_j$ respectively, with $m_1 | m_2 | \ldots | m_n$, and $C_{j+1} \ldots C_k$ are infinite.

2. Let R be a unique factorization domain. Then prove that the polynomial ring $R[x]$ over R is also a unique factorization domain.

Name of the Faculty: **Dr. G. Upender Reddy**
Dept. **Mathematics**

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INTERNAL ASSIGNMENT QUESTION PAPER

COURSE : M.Sc. (Mathematics) I Semester

Paper : II **Subject :** Mathematical Analysis

Total Marks :

Section – A

UNIT – I : Answer the following short questions (each question carries two marks) 5x2=10

1. Prove that Every neighborhood is an open set
2. Prove that closed subsets of compact sets are compact
3. Let f be a monotonically increasing function defined on $[a,b]$ and α be continuous on $[a,b]$. Then Prove that $f \in R(\alpha)$ on $[a,b]$
4. Suppose $\{f_n\}$ is a sequence of real or complex valued functions defined on set E which converges pointwise to a limit function f defined on E. Let $M_n = \sup|f_n(x) - f(x)|$. Then Prove that $f_n \to$ uniformly on E if and only if $M_n \to 0$ as $n \to \infty$
5. Let f be a monotonically increasing function defined on (a,b). Then Prove that the set E of all discontinuities of 'f' is atmost countable.

Section – B

UNIT – II : Answer the following Questions (each question carries ten marks) 2x10

1) a) Prove that Every k-cell is compact in $\mathbb{R}^k$

b) Let X and Y be metric spaces with metrics d_x and d_y respectively. Let $f: X \to Y$ be a mapping. Then Prove that f is continuous on X if and only if inverse image of an open set in Y is open in X.

c) Let 'f' be a continuous mapping defined on a metric space X into a metric space Y. If E is a connected subset of X then Prove that $f(E)$ is a connected subset of Y

d)

Name of the Faculty :

Dept. ____________

d) Let 'f' be a continuous mapping defined on a compact metric space (X, d_x) into a metric space (Y, d_y). Then Prove that f is uniformly continuous on X.

2. a) Prove that If $f \in R(\alpha)$ on $[a,b]$ if and only if given any $\epsilon > 0$ there exists a partition P of $[a,b]$ such that $U(P,f,\alpha) - L(P,f,\alpha) < \epsilon$

b) Suppose $f \in R(\alpha)$ on $[a,b]$, $m \le f(x) \le M$, $\forall x \in [a,b]$. Let ϕ be a continuous function defined on $[m,M]$. If $h(x) = \phi(f(x))$, $\forall x \in [a,b]$, then Prove that $h \in R(\alpha)$ on $[a,b]$

c) Prove that There exists a real valued continuous function on the real line which is nowhere differentiable

d) State and Prove Weierstrass approximation theorem.

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OSMANIA UNIVERSITY, HYDERABAD, 500007
INTERNAL ASSIGNMENT QUESTION PAPER (JUNE-2025)
M.Sc -MATHEMATICS , SEMESTER-1, PAPER-III
ORDINARY DIFFERENRIAL EQUATIONS

SECTION – A

Answer the following short questions ($5 \times 2 = 10$)

1. Determine the largest interval of existence of solution of IVP
   $x' = t^2 + x^2,\ \ x(0) = 0,$ in $\{0 \leqslant t \leqslant \frac{1}{2},\ \ |x| \leqslant b\}$
2. Let f_1 and f_2 be linearly independent functions on an interval I. Prove that the functions $f_1 + f_2$ and $f_1 - f_2$ are also linearly independent on I.
3. Express $2t + t^3$ in terms of Legendre polynomials.
4. Find the indicial polynomial for the equation
   $t^2x'' + t(3-3t)x' + (1-3t+t^2)x = 0$
5. Show that $x'' + \frac{x}{1+t} = 0\ \ t \geqslant 0$ is oscillatory.

SECTION B (2*10 = 20)

1. (i). State and prove Picards theorem.
   (ii). Find the series solution of Bessel equation.
2. (i). Solve $x''' - x' = e^t$ by using method of separation of parameters.
   (ii). Explain about Strum-Liouville problem and prove that eigen values of Strum-Liouville problem are real.

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Internal Assignment Examination

Course: M.Sc (Mathematics) I Semester

Paper – IV: Elementary Number Theory

Max. Marks: 30

Note: Answer All Questions

Section – A (5 × 2 = 10 Marks)

1. Show that there exists infinitely many primes.
2. If f is a multiplicative function, then show that $f(1) = 1$.
3. If $a \equiv b \ (mod\ m)$ and $a \equiv b \ (mod\ n)$, then show that $a \equiv b \ (mod\ mn)$.
4. Evaluate (50|71).
5. State and prove Wilson's Theorem.

Section – B (2 × 10 = 20 Marks)

6. State and prove Euclidean Algorithm.
7. State and prove Lagrange's Theorem for polynomial congruence.

Dr. V. Kiran

Department of Mathematics

UCS, OU, Hyd – 7