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

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)

DIRECTOR
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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 II 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 **05-03-2025** 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.

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 **05-03-2025** at the concerned counter at PGRRCDE, OU on any working day and obtain receipt.

DIRECTOR

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INTERNAL ASSIGNMENT QUESTION PAPER

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

Paper: I **Subject: Galois Theory**

Section – A

UNIT – I: Answer the following short questions (each question carries two marks) $(5\ X\ 2 = 10M)$

1. Let $f(x) = a_0 + a_1x + a_2x^2 + \cdots + a_{n-1}x^{n-1} + x^n \in \mathbb{Z}[x]$ be monic polynomial. If $f(x)$ has a root $a \in Q$ then prove that (i) $a \in \mathbb{Z}$ (ii) $a \mid a_0$
2. Prove that the prime field of a field F is either isomorphic to Q or to $Z/(p)$, where p is a prime.
3. Let F and E be fields, and let $\sigma_1, \sigma_2, \ldots \sigma_n$ be distinct embeddings of F into E. Suppose that, for $a_1, a_2, \ldots a_n \in E, \sum_{i=1}^{n} a_i\sigma_i(a) = 0$ for all $a \in F$, then prove that $a_i = 0$ for all $i = 1, 2, \ldots n$.
4. If $f(x) \in F[x]$ has r distinct roots in its splitting field E over F, then prove that Galois group $G(E/F)$ of $f(x)$ is a subgroup of the symmetric group S_r.
5. Let E be the splitting field of $x^n - a \in F[x]$ then prove that $G(E/F)$ is a solvable group.

Section – B

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

1. Let E be an algebraic extension of a field F contained in an algebraic closure $\bar{F}$ of F, then prove that the following conditions are equivalent
   (i) Every irreducible polynomial in $F[x]$ that has a root in E splits into linear factors in E.
   (ii) E is the splitting field of a family of polynomials in $F[x]$.
   (iii) Every embedding σ of E in $\bar{F}$ that keeps each element of F fixed maps E onto E
2. (i) Let $f(x)$ be a polynomial over a field F with no multiple roots, then prove that $f(x)$ is irreducible over F if and only if the Galois group G of $f(x)$ is isomorphic to a transitive permutation group.
   (ii) Let $f(x) \in Q[x]$ be a monic irreducible polynomial over Q of degree p, where p is prime. If $f(x)$ has exactly two nonreal roots in C, then prove that the Galois group of $f(x)$ is isomorphic to S_p.

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

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INTERNAL ASSIGNMENT EXAMINATION QUESTION PAPER

COURSE : M.Sc (Mathematics) Previous II Semester

Paper:II. Subject : Lebesgue Measure and Integration

Note: Answer All the following questions. Max Marks 30

Section-A (5 x 2 = 10 M)

(1) Show that the smallest σ-algebra containing the class of all open sets O is the class of all Borel sets.

(2) State and prove bounded convergence theorem.

(3) State and prove Fatou"s lemma.

(4) Show that every monotonic increasing real valued function defined on [a , b] is always of bounded variation on [a , b].

(5) State and prove Holder"s inequality.

Section - B (2 x 10 = 20 M)

(6) Show that there exists a bounded non measurable set.

(7) State and prove Riesz-Fisher theorem.

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Department of Mathematics

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INTERNAL ASSIGNMENT QUESTION PAPER

COURSE : M.Sc. (Mathematics) Previous II Semester

Paper : III **Subject :** Complex Analysis

Total Marks: 30

Section – A

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

1 Define Maximum Modulus Principle

2 Define Liouville's

3 Find the harmonic functions of v where

4 $u = x^2 - 3xy^2 + 3x^2 - 3y^2$

5 Discuss singularity of $\frac{1}{1-e^z}$ at $z = 2\pi i$

5. Define Laurent's Series

Section – B

UNIT – II : Answer the following Questions (each question carries ten marks) **2x10=20**

1 Evaluate $\oint_C \frac{4-3z}{z(z-1)(z-2)} dz$ where C is the circle $|z| = 3/2$

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2) using residue theorem and Evaluate

$f(z) = \frac{z^2}{(z-1)^2(z+2)}$

where C is the circle $|z| = 3$

Name of the Faculty : Dr. K. Ramesh Babu

Dept. 30/12/24

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INTERNAL ASSIGNMENT QUESTION PAPER

COURSE : M.Sc. (Mathematics) Previous II Semester

Paper : IV **Subject :** IES & CoV

Total Marks: 30

Section – A

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

1 Using resolvent kernel, solve $\phi(x) = e^{x} + \int_0^x e^{x-t} \phi(t)\, dt$

2 Convert $y'' + y = 0$, $y(0) = 1$, $y'(0) = 0$ to integral equations.

3 Solve $\phi(x) = 1 + x + \int_0^x e^{-2(x-t)} \phi(t)\, dt$ using Laplace transforms.

4 Solve $\phi(x) = \tan x + \int_{-1}^{1} e^{\sin^{-1} x} \phi(t)\, dt$.

5 Find the characteristic numbers and eigen functions of $\phi(x) = \lambda \int_0^{2\pi} \sin x \cos t\, \phi(t)\, dt$.

Section – B

UNIT – II : Answer the following Questions (each question carries ten marks) **2x10=20**

1. Construct Green's function for $y'' + k^2 y = 0$, $y(0) = y(1) = 0$.
2. State and prove Hamilton's principle.

Name of the Faculty : Prof. V. Naga Raju

Dept. Mathematics