INTERNAL ASSIGNMENT QUESTIONS

M.Sc. (Mathematics) II Semester

2026-2027

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
Sr. Prof. N.Ch. Bhatracharyulu
Hyderabad – 7 Telangana State

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) :

- First read the subject matter in the course material that is supplied to you.
- If possible read the subject matter in the books suggested for further reading.
- 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).
- Give a final reading to the answer you have written and see whether you can delete unimportant or repetitive words.
- 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 :**

- Write the above said details clearly on every subject assignments paper, otherwise your paper will not be valued.
- Tag all the assignments paper wise and submit them in the concerned counter.

Submit the assignments on or before **30.11.2026** at the concerned counter at PGRRCDE, OU on any working day and obtain receipt.

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INTERNAL ASSIGNMENT QUESTION PAPER – 2025-26

Course : M.Sc. (Mathematics) II Semester

Paper : Paper 1 Subject : **Galois Theory**

Total Marks: 30

Section – A

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

1. (a) The polynomial $\Phi_p(x) = 1 + x + x^2 + \ldots + x^{p-1}$ is irreducible over Q, where p is a prime number.
   (b) Let $F \subseteq E \subseteq K$ be fields. If $[K:E] < \infty$, $[E:F] < \infty$, then (i) $[K:F] < \infty$ (ii) $[K:F] = [K:E][E:F]$.
2. (i) Find the degree of an extension of the splitting field of the polynomial $x^3 - 2 \in Q[x]$.
   (ii) If $f(x) \in F[x]$ is irreducible over F, then all the roots of f(x) have the same multiplicity.
3. State and prove Dedekind's Lemma.
4. Show that $\Phi_8(x)$ and $x^8 - 1$ have the same Galois group, namely $(Z/(8))^* = \{1, 3, 5, 7\} \cong V_4$ (Klein 4-group).
5. Prove that the polynomial $f(x) = x^7 - 10x^5 + 15x + 5$ is not solvable by radicals over Q.

Section – B

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

1. (i) The Galois group of $x^4 + 1 \in Q[x]$ is the Klein 4-group.
   (ii) Let E be a splitting field of $x^n - a \in F[x]$; then G(E/F) is a solvable group.
2. State and prove the Fundamental Theorem of Algebra.

Name of the Faculty : V. Venkateshwarlu
Dept. Mathematics

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INTERNAL ASSIGNMENT QUESTION PAPER

COURSE : M.Sc. (Mathematics) II Semester

Paper : Paper 2 Subject : **Lebesgue Measure**

Total Marks: 30

Section – A

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

1. Let $E \subset R$ with $m^*(E) = 0$; then show that E is a Lebesgue measurable set.
2. If $f : [5, 11] \rightarrow R$ is defined as $f(x) = 1 / (x^2 - 3x)$, then find the total variation of f.
3. If $f : [a, b] \rightarrow R$ is absolutely continuous, then show that f is of bounded variation on [a, b].
4. Define Lebesgue integral of a non-negative measurable function with example.
5. Define absolutely continuous function with example.

Section – B

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

6. (a) Show that the outer measure of an interval is its length.

(OR)

(b) State and prove Lebesgue convergence theorem.

7. (a) State and prove Vitali covering lemma.

(OR)

(b) If $f : [a, b] \rightarrow R$ is a bounded variation function on [a, b], show that f can be expressed as the difference of two monotonic non-decreasing functions.

Name of the Faculty : _____

Dept. Mathematics

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INTERNAL ASSIGNMENT QUESTION PAPER

COURSE : M.Sc. (Mathematics) II Semester

Paper : Paper 3 Subject : **Complex Analysis**

Total Marks: 30

Section – A

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

1. Find real and imaginary parts of $f(z) = z^2 + z$.
2. Define Cauchy–Goursat Theorem and evaluate $\oint_{|z|=1} (e^z / z)\, dz$.
3. Evaluate $\oint_C (5z - 2) / (z(z - 1))\, dz$, where C is $|z| = 2$.
4. Evaluate $\oint_C (f'(z) / f(z))\, dz$, where $f(z) = (z^2 - 1) / (z^2 + 2)^2$ and C : $|z| = 2$.
5. Show that the inverse of a bilinear transformation is also a bilinear transformation.

Section – B

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

1. State and prove Cauchy Integral Formula.
2. Find an analytic function whose real part is $u(x, y) = y^3 - 3x^2y$.

Name of the Faculty : Dr. P. Thirupathi
Dept. Mathematics

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INTERNAL ASSIGNMENT QUESTION PAPER

COURSE : M.Sc. (Mathematics) II Semester

Paper : Paper 4 Subject : **Integral Equations & Calculus of Variations**

Total Marks: 30

Section – A

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

1. Verify that the given function $\varphi(x) = 1 / (1 + x^2)^{3/2}$ satisfies $\varphi(x) = 1 / (1 + x^2) - \int_0^x [t / (1 + x^2)] \varphi(t)\, dt$.
2. Find the iterated kernel for the kernel $K(x, t) = x - t$ if $a = 0$, $b = 1$.
3. On what curves is the functional $V[y(x)] = \int_0^{\pi/2} (y'^2 - y^2)\, dx$ extremized, given $y(0) = 0$, $y(\pi/2) = 1$?
4. Find the Ostrogradsky function for $V(z(x, y)) = \iint_D [(\partial^2 z/\partial x^2)^2 + (\partial^2 z/\partial y^2)^2 + 2(\partial^2 z/\partial x \partial y)^2]\, dx\, dy$, where the values of z are prescribed on the boundary C of the domain D.
5. Solve the integral equation $\varphi(x) = e^x - \int_0^x e^{(x-t)} \varphi(t)\, dt$.

Section – B

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

1. (a) Solve the integral equation $\varphi(x) - \lambda \int_{-\pi}^{\pi} (x \cos t + t^2 \sin x + \cos x \sin t) \varphi(t)\, dt = x$. (5M)
   (b) (i) Solve the integral equation $\varphi(x) = \cos x - \int_0^x (x - t) \cos(x - t) \varphi(t)\, dt$. (5M)
   (ii) Find the Green's function for the BVP $d^2y/dx^2 + \lambda^2 y = 0$ with $y(0) = 0 = y(1)$.
2. (a) Determine the extremals of the functional (5M)
   $V(y(x)) = \int_{-l}^{l} (\tfrac{1}{2} \mu y''^2 + \delta y)\, dx$, subject to $y(-l) = 0$, $y'(-l) = 0$, $y(l) = 0$, $y'(l) = 0$.
   (b) (i) Hamilton's equations of motion – State and prove. (5M)
   (ii) Find the shortest distance between two given points in a given plane.

Name of the Faculty : E. Srinivas
Dept. Mathematics