INTERNAL ASSIGNMENT QUESTIONS

M.Sc. (Mathematics) IV 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) IV Semester

Paper : ISubject : **Functional Analysis.**

Total Marks: 30

Section – A

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

1) Prove Riesz's lemma.

2) State and prove the parallelogram law.

3) Let T be a bounded linear operator on a complex Hilbert space H and $\langle Tx,x\rangle$ is real.

4) Let X be a normed space, $x \neq 0$ be any element of X. Then prove that there exists a bounded linear functional f on X such that $\|f\| = 1$ and $f(x) = \|x\|$.

5) In X is an inner product space, then prove that $\|x + y\| \leq \|x\| + \|y\| \quad \forall\ x, y \in X$.

Section -B

UNIT -II : Answer the following Long questions (each question ten marks) 2x10=20

(i) *Prove that every finite dimensional subspace Y of a normed space X is complete.*

(ii) *State and prove Bessel's inequality in an inner product space X.*

2) State and Prove the Closed Graph Theorem.

Name of the Faculty : V. Venkateshwarlu
Department: Mathematics

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INTERNAL ASSIGNMENT QUESTION PAPER

COURSE : M.Sc. (Mathematics) IV Semester

Paper : Paper 2Subject : **PDE**

Total Marks: 30

Section – A

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

1. Find a PDE from the following eliminating $f(x + y + z, x^2 + y^2 + z^2) = 0$.
2. Solve $(D^2 - D'^2 + D + D')\, u = e^{2x+3y}$.
3. Find the Fourier transform of $f(x) = e^{-x^2/2}$.
4. Solve the Neumann boundary value problem:

$$u_{xx} + u_{yy} = 0, \quad -\infty < x < \infty, \quad y > 0$$
$$u_y(x, 0) = f(x), \quad -\infty < x < \infty,$$

with u bounded as $y \to \infty$, and u, $u_x \to 0$ as $|x| \to \infty$.

5. Find the complete integral of $p^2 + q^2 = x + y$.

Section – B

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

1. (a) Find the complete integral of PDE $(p^2 + q^2)y = qz$. **(5M)**

   (b) Reduce the equation $3u_{xx} + 10u_{xy} + 3u_{yy} = 0$ to a canonical form and hence solve it. **(5M)**

2. (a) State and prove Convolution Theorem and Parseval's relation. **(5M)**

   (b) (i) Write about D'Alembert's solution in IVP. **(5M)**

   (ii) The boundaries of the rectangle $0 \le x \le a$, $0 \le y \le b$ are maintained at zero temperature. If at $t = 0$ the temperature T has the prescribed value f(x, y), show that for $t > 0$ the temperature at a point within the rectangle is given by

$$T(x, y, t) = (4/ab) \Sigma\Sigma\, f(m, n) \exp(-\alpha\lambda^2 mn\, t) \sin(m\pi x/a) \cdot \sin(n\pi y/b)$$

(summation over m = 1 to ∞ and n = 1 to ∞)

where

$$f(m, n) = \int_0^a \int_0^b f(x, y) \sin(m\pi x/a) \sin(n\pi y/b)\, dx\, dy$$

and

$$\lambda^2 mn = \pi^2 (m^2/a^2 + n^2/b^2)$$

Name of the Faculty : E. Srinivas

Dept. Mathematics

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INTERNAL ASSIGNMENT QUESTION PAPER

COURSE : M.Sc. (Mathematics) IV Semester

Paper : Paper 3Subject : **Numerical Analysis**

Total Marks: 30

Section – A

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

1. Show that the Newton–Raphson method has second order convergence.
2. Solve the system of equations using the Gauss Elimination Method:

$$3x_1 + 3x_2 + 4x_3 = 20$$
$$2x_1 + x_2 + 3x_3 = 13$$
$$x_1 + x_2 + 3x_3 = 6$$

3. (a) Define (i) Shift operator (ii) Forward difference operator.
   (b) Prove (i) $1 + \Delta = (1 - \nabla)^{-1}$ (ii) $\mu = [1 + \delta^2/4]^{1/2}$.
4. Derive the least squares straight line and quadratic fits for discrete data (x_i, f_i); i = 0, 1, 2, …, N.
5. Use two point and three point Gauss formula to evaluate $\int dx / (x^2 + 2x + 10)$ from x = 0 to x = 2.

Section – B

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

1. (i) Find the real root of the equation $3x = \cos x + 1$ by Newton–Raphson Method.
   (ii) Solve the following system of equations using the Gauss Seidel Iteration Method:

$$27x + 6y - z = 85$$
$$x + y + 54z = 110$$
$$6x + 15y + 2z = 72$$

2. (i) Find y at x = 0.1 correct to 3 decimal places, given $y' - 2y = 3e^x$, y(0) = 0 by the Taylor's Series Method.
   (ii) Obtain the solution by Fourth order Runge–Kutta Method, find y(0.4) given that $y' = x + y^2$, y(0) = 1.34546 (Take h = 0.2).

Name of the Faculty : Dr. I. G. Shyam Sunder
Department: Mathematics

STATISTICS – ASSIGNMENT

Semester IV

Maximum Marks: 30

SECTION – A

Short Answer Questions (5 × 2 = 10 Marks)

1. Three machines A, B and C produce 30%, 45% and 25% of the total items, respectively. Their defective rates are 2%, 3% and 4%. If an item is found defective, find the probability that it was produced by machine B.
2. If X follows a binomial distribution with n = 6 and p = 0.4, find: (a) $P(X = 3)$ (b) $P(X \geq 4)$.
3. The average number of accidents per day is 2. Assuming a Poisson distribution, find the probability of: (a) Exactly 3 accidents (b) No accidents.
4. The marks obtained by students are normally distributed with mean 60 and standard deviation 10. Find the probability that a student scores between 50 and 70 marks.
5. A random sample of 10 observations has a mean of 52 and a sample standard deviation of 6. Test whether the population mean is 50 at the 5% level of significance, assuming a normal population.

SECTION – B

Long Answer Questions (2 × 10 = 20 Marks)

6. (a). Two independent large samples give the following results:

Particulars	Sample I	Sample II
Sample size	100	120
Sample mean	68	72
Sample standard deviation	10	12

Test whether the difference between the population means is significant at the 5% level of significance. (5 Marks)

6. (b). A random sample of 10 observations has a mean of 52 and a sample standard deviation of 6. Test whether the population mean is 50 at the 5% level of significance, assuming a normal population. (5 Marks)

7. (a). A die is thrown 120 times, and the following frequencies are observed:

Face	1	2	3	4	5	6
Frequency	18	22	20	16	24	20

Apply the chi-square test to determine whether the die is fair at the 5% level of significance. (5 Marks)

7. (b). The following data represent the classification of 200 students according to gender and preference for online or offline learning.

Gender	Online	Offline	Total
Male	60	40	100
Female	45	55	100
Total	105	95	200

Apply the chi-square test to examine whether gender and learning preference are independent at the 5% level of significance. (5 Marks)

Total Marks: 30