A–1013

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MAT-508

M.Sc. Mathematics (MSCMT)

Advanced Differential Equation-II

Examination February, 2026

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *Two* (02) questions only.

1. Find the family orthogonal of $\phi[z(x + y)^2, x^2 - y^2] = 0$.

2. Show that the equations $xp = yq$ and $z(xp = yq) = 2xy$ are compatible and solve them.

3. Reduce the equation $r + 2xs + x^2t = 0$ to canonical form and hence solve it.

4. Solve: $r = a^2t$.

5. Solve two dimensional Laplace's equation in plane Polar coordinates $r(r, \theta)$.

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *Four* (04) questions only.

1. Solve the partial differential equation by eliminating the arbitrary function f from the equation $x + y + z = f(x^2 + y^2 + z^2)$.

2. Solve :

$$x(y^2 - z^2)q - y(z^2 + x^2)q + z(x^2 + y^2)$$

3. Write a short note on Boundary Value Problem.

4. Explain how the method of Green's function useful in obtaining the solutions of Poisson's equations.

5. Find the complete integral of $z = px + qy + q^2 + p^2$.

6. Find the characteristics of $4(\sin^2 x)r + (2 \cos x)s - t = 0$.

7. Solve :

$$3r + 4s + t + (rt - s^2) = 1$$

8. Explain the concept of spherical polar coordinates in detail.

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