A–0687

Total Pages : 3 **Roll No. ....**

MAT-508

M.Sc. Math (MSCMT)

(Advanced Differential Equation–II)

Examination, June 2025

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. Derive the general solution of the Lagrange equation.

2. Show that the equations $xp - yq = x$ and $x^2 p + q = zx$ are compatible and solve them.

3. Reduce $\frac{\partial^2 z}{\partial x^2} = (1+y)^2 \left(\frac{\partial^2 z}{\partial y^2} \right)$ to canonical form.

4. Solve two dimensional Laplace's equation in spherical coordinates (r, θ, ϕ).

5. Solve :

$$(x - y)(xr - xs - ys + yt) = (x - y)(p - q)$$

by Monge's method.

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 :

$$pq = x(ps - qr)$$

2. Solve :

(a) $(y - z)p + (z - x)q = (x - y)$

(b) $zp = -x$

3. Solve the partial differential equation $2p + 3q = 1$ by Lagrange's Methods.

4. Solve :

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

5. Obtain the general solution of wave equation :

$$\frac{\partial^2 u}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}$$

6. Derive the Green's function for the operator $\frac{d^2}{dx^2}$ with the boundary conditions $y(0) = 0$ and $y(1) = 0$.

7. Define the following :

   (a) Singular integral equation

   (b) The Abel's integral equation

   (c) Green's Function

   (d) Finite element method

8. Discuss the Green's function in one dimension.

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