A–895

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

MAT–508

M.Sc. MATHEMATICS (MSCMT)

(Advanced Differential Equation-II)

2nd Semester Examination, 2024 (June)

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. Solve the partial differential equation by eliminating a, b, c from $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$.

2. Using Charpit's method, find three complete integral of $pq = px + qy$.

3. Reduce PDEs $y^2\frac{\partial^2 z}{\partial x^2}+x^2\frac{\partial^2 z}{\partial y^2}=0$ or $y^2r + x^2t = 0$ to canonical form.

4. Solve $r + (a + b)s + abt = xy$.

5. Solve two dimensional Laplace's equation in polar Coordinates (r, θ).

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. (a) Solve $p \tan x + q \tan y = \tan z$.

   (b) Solve $xzp + yzq = xy$

2. Find the integral surface of the linear partial differential equation :

$$(x^2 + z)p - y(x^2 + z) = (x^2 - y^2)z$$

3. (a) Find the complete integral of $q = 3p^2$.

   (b) Classify $u_{xx} = u_{yy} + u_{zz}$.

4. Discuss the interior Neumann Problem for a Circle formulation mathematically.

5. (a) Find the characteristic of $y^2r - x^2t = 0$

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

6. Obtain the solution of two-dimensional diffusion equation :

$$\frac{\partial^2 \theta}{\partial x^2} + \frac{\partial^2 \theta}{\partial y^2} = \frac{1}{k} \frac{\partial \theta}{\partial t}$$

7. Find the Green's function of :

$$\left(\frac{\partial^2 y}{\partial x^2} - k^2 y \right) = f(x); y(\pm\infty) = 0$$

8. Define the following :

   (a) Integral Equation

   (b) Finite Element Method

   (c) Laplace transformation

   (b) Complete integral and Particular integral

****