MMDSC-2.4

Sl.No. :

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Second Semester M.Sc. Degree Examination, October - 2025

(SLM Scheme) (CBCS)

MATHEMATICS

Partial Differential Equation

Time : 3 Hours **Max. Marks : 80**

Instruction : ***Answer any five full questions.***

1) a) Eliminate arbitrary constants a and b from $Z = (x-a)^2 + (y-b)^2$ to form the partial differential equation.

b) Solve $p\sqrt{x} + q\sqrt{y} = \sqrt{Z}$.

c) Find the orthogonal trajectories of the family of curves $x^2 + y^2 = c^{2'}$ where C is an arbitrary constant.

[5 + 5 + 6]

2) a) Solve the pfaffian equation $xdy - ydx - 2x^2 zdz = 0$

b) Find the Cauchy problem for $3u_x + 2u_y = 0$ and $u(x,0) = sinx$.

c) Solve the equation $(4D^2 + 12DD' + 9D'^2)z = e^{3x+2y}$

[4 + 6 + 6]

3) a) Find a complete integral of $yzp^2 - q = 0$

b) Solve $p^2 + qy - u = 0$ by charpit's method.

c) Solve $p^2x + q^2y = z$ by Jacobi's method.

[6 + 6 + 4]

4) a) Classify the partial differential equation $u_{xx} - u_{xy} + xy\, u_{yy} = 0$.

b) Classify the equation $\frac{\partial^2 u}{\partial x^2} = x^2 \frac{\partial^2 u}{\partial y^2}$ and reduce it to the canonical form.

[6+10]

5) a) Solve $2zx - px^2 - 2pxy + pq = 0$

b) Prove that $u,(r,\theta) = \frac{1}{2\pi}\int_0^{\pi} \frac{(a^2 - r^2) f(\theta)}{[a^2 - 2ar\cos(\phi - \theta) + r^2]} d\phi.$

[4+12]

6) a) If the Neumann problem for a bounded region has a unique solution then prove that it is either unique or it differs from one-another by a constant.

b) If *f(t)* is any continuous function then show that $\int_{-\infty}^{\infty} \delta(t-a) f(t) dt = f(a)$.

[8+8]

7) a) Find eigen values and eigen functions of $y'' + \lambda y = 0, 0 \le x \le \pi, y(0) = 0, y(\pi) = 0$

b) Solve by the method of separation of variables $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} = 0$

[8+8]

8) a) Prove that dirichlet problem for a bounded region has a unique solution.

b) Find the steady - state temperature of the rod. If the fixed temperature at the ends $x=0$ and $x = \pi$ are ω_1 and ω_2 respectively.

[8+8]