MMDSE-2.4

Sl.No. :

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II Semester M.Sc. Degree Examination, May - 2026
(SLM Scheme) (CBCS)
MATHEMATICS
Partial Differential Equation

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

Instruction : Answer any Five full questions.

Q1) a) Find the partial differential equation by eliminating arbitrary constants $z = ax + a^2y^2+b$.

b) Solve $p\cot x + q\cot y = \cot z$.

c) Find the orthogonal trajectories of the family of curves $x^{2/3} + y^{2/3} = c^{2/3}$.

[5 + 5 + 6]

Q2) a) Solve the pfaffian equation $xdy - ydx = 0$.

b) Find the Cauchy problem for $u_x + u_y + u = 1$ with intial data $u = \sin x$ on $y = x + x^2$.

c) Solve $(D^2 + 3DD'+2D'^2)\, z = x + y$.

[4 + 6 + 6]

Q3) a) Find the complete integral of the equation $p^2 + qy - u = 0$.

b) Solve $z = px + qy + p^2 + q^2$ by Charpit's method.

c) Classify the partial differential equation $z_{xx} + z_{yy} = 0$.

[6 + 6 + 4]

Q4) a) Classify the equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}+2\frac{\partial^2 u}{\partial y \partial x}=0$ and reduce it to canonical form.

b) Solve $\frac{\partial^2 w}{\partial r^2}+\frac{1}{r}\frac{\partial w}{\partial r}+\frac{1}{r^2}\frac{\partial^2 w}{\partial r^2}=0$.

[10 + 6]

Q5) a) State and prove poisson integral formula.

b) Solve the Boundary value problem $\frac{\partial u}{\partial x}=4\frac{\partial u}{\partial y}$ if $u(0, y) = 8e^{-3y} + 4e^{-3y}$.

[10 + 6]

Q6) a) Construct an adjoint to the Laplace operator given by $L(u) = u_{xx} + u_{yy}$.

b) Prove that $\int_{-\infty}^{\infty}\delta^1(t-a)f(t)dt=-f^1(a)$.

[10 + 6]

Q7) a) Derive D' Alembert solution of one dimensional wave equation.

b) Solve $y'' + \lambda y = 0$, $0 < x < L$ with $y(-L) = y(L)$ and $y'(-L) = y'(L)$ by using periodic Eigen value problem.

[10 + 6]

Q8) a) Solve $\frac{d^2 y}{dx^2}=f(x)=1, \ \forall x\in[0,1]$ by strum's Liouville problem using Green's function method with boundary conditions $y(0) + y'(0) = 0$, $y(1) + y'(1) = 0$.

b) Solve $u_{tt} + C^2 u_{xx}$, $-\infty < x < \infty$, $0 < t < \infty$.

[10 + 6]

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