Registration Number:

Date & session:

ST JOSEPH'S UNIVERSITY, BENGALURU-27
M.Sc (MATHEMATICS) - II SEMESTER
SEMESTER EXAMINATION: APRIL, 2023
(Examination conducted in May 2023)
MT 8421 – PARTIAL DIFFERENTIAL EQUATIONS
(For current batch students only)

Time: 2 Hours **Max. Marks:** 50

1. This paper contains **ONE** printed page.
2. Attempt any **FIVE FULL** questions.
3. Every question carries **TEN** marks .

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1. a) Find the integral surface of the partial differential equation $(x-y)y^2p+(y-x)x^2q=(x^2+y^2)z$ passing through the curve $xz=a^3$, $y=0$.
   b) Classify the given partial differential equation and find its characteristics $y^2r-x^2t=0$. (6+4)

2. Solve $y(x+y)(r-s)-xp-yq-z=0$ by reducing it to canonical form.

3. a) Solve $(D^2-3DD'+2D'^2)z=e^{2x-y}+e^{x+y}$.
   b) Solve $x^2r-3xys+2y^2t+px+2qy=x+2y$. (5+5)

OR

Solve $(r-s)y+(s-t)x+q-p=0$ using Monge's method.

4. Solve the Dirichlet problem $\nabla^2u=0$, $0<x<1$, $0<y<1$ subjected to the boundary conditions $u(x,0)=x(x-1)$, $u(x,1)=0$, $u(0,y)=0$, $u(1,y)=0$.

5. Using Riemann-Volterra method, solve $\dfrac{\partial^2 z}{\partial x^2}=\dfrac{\partial^2 z}{\partial y^2}$ where $z, \dfrac{\partial z}{\partial x}, \dfrac{\partial z}{\partial y}$ are prescribed along a curve C in the xy-plane.

6. Obtain the general solution of three-dimensional heat equation in cylindrical co-ordinate system.

7. Using the method of eigen function expansion, obtain the solution of

$$\frac{\partial^2 u}{\partial t^2}-\frac{\partial^2 u}{\partial x^2}=x^2sin(\pi x),$$

where $0<x<1$, $t>0$ subjected to the conditions

$$u(0,t)=0,$$
$$u(1,t)=0,$$
$$u(x,0)=\pi,$$
$$\frac{\partial u}{\partial t}(x,0)=2\pi\ sin(2\pi x).$$