Register Number:

Date and Session:

ST. JOSEPH'S UNIVERSITY, BENGALURU -27
M.Sc (MATHEMATICS) - 2^{nd} SEMESTER
SEMESTER EXAMINATION: APRIL 2024
(Examination conducted in May/June 2024)
MT 8421:Partial Differential Equations

(For current batch students only)

Time: 2 Hours Max Marks: 50

This paper contains **ONE** printed page.

Answer any FIVE of the following. **[$5 \times 10 = 50$]**

1. (a) Solve the PDE: $yzp + 2xq = xy$.
   (b) Find the integral surface of the PDE: $(y - z)p + (z - x)q = x - y$ passing through $z = 0$ and $y = 2x$. **[4+6]**
2. Find the general solution of the PDE: $r + 2s + t = 0$ by reducing to its canonical form.
3. (a) Solve the PDE: $r - s - 2p = sin(3x + 4y)$.
   (b) Solve the PDE: $x^2r - y^2t - yq + xp = 0$. **[5+5]**

OR

Using Monge's method obtain the solution of the given PDE: $r = 9t$.

4. Obtain the general solution of 1-D wave equation using the method of separation of variables.
5. Find the steady state temperature distribution in a rectangular plate bounded by the lines $x = 0$, $x = a$, $y = 0$ and $y = b$ whose edge $y = 0$ is insulated, the edges $x = 0$ and $x = a$ are kept at 0^oC and the edge $y = b$ is kept at temperature $f(x)$.
6. Derive the general solution of 3-D heat equation in cylindrical coordinates.
7. Solve the following problem using the method of eigen function expansion:
   $u_{tt} - u_{xx} = \pi^2 sin(\pi x)$, where $0 < x < 1, t > 0$, subjected to the boundary conditions
   $u(0, t) = 0, \quad u(1, t) = 0, \quad u(x, 0) = \pi$ and $\quad u_t(x, 0) = 2\pi sin(2\pi x)$.

**********END**********