SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF MATHEMATICS

18MAB201T/Transforms and Boundary value problems

UNIT III - APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

TUTORIAL SHEET -1

PART-B QUESTIONS

1. **Classify the equation** $x^2 f_{xx} + (1 - y^2) f_{yy} = 0$.
2. **Classify the equation** $(1 + x^2) f_{xx} + (5 + 2x^2) f_{xy} + (4 + x^2) f_{yy} = 2\sin(x + y)$.
3. **Classify the equation** $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = f(x, y)$.
4. **Write down the assumptions made in deriving one-dimensional wave equations.**

PART-C QUESTIONS

4. **A tightly stretched string with fixed end points** $x = 0$ **and** $x = l$ **is initially in a position given by** $y(x, 0) = y_0 \sin\left(\frac{\pi x}{l}\right)$. **If it is released from rest from this position, find the displacement** y **at any time and at any distance from the end** $x = 0$.
5. **An elastic string is stretched between two fixed points at a distance** π **apart. In its initial position the string is in the shape of the curve** $f(x) = k(\sin x - \sin^3 x)$. **Obtain** $y(x, t)$ **the vertical displacement if** y **satisfies the equation** $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$.
6. **Find the solution of the wave equation** $\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$, **corresponding to the triangular initial deflection** $f(x) = \begin{cases} \frac{2kx}{l}, 0 < x < \frac{l}{2} \\ \frac{2k}{l}(l - x), \frac{l}{2} < x < l \end{cases}$ **and the initial velocity is zero.**