SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF MATHEMATICS

18MAB201T/Transforms and Boundary value problems

UNIT III - APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

TUTORIAL SHEET -3

PART-B QUESTIONS

1. **Write down the assumptions made in deriving one-dimensional heat equation.**
2. **Write down the possible solutions and correct solution of one dimensional heat equations.**
3. **A homogeneous rod of conducting material of length l units has ends kept at zero temperature and the temperature at the centre is T and falls uniformly to zero at the two ends. Write down the initial and boundary conditions.**
4. **A rod 30cm long has its ends A and B kept at $20^{\circ}C$ and $80^{\circ}C$ respectively until steady state conditions prevail. Find the steady state temperature in the rod.**

PART-C QUESTIONS

5. **Solve $\frac{\partial u}{\partial t} = \alpha^2 \frac{\partial^2 u}{\partial x^2}$ subject to (i) $u(0,t) = 0$, for $t \geq 0$ (ii) $u(l,t) = 0$, for $t \geq 0$**
   (iii) $u(x,0) = \begin{cases} x, & \text{for } 0 \leq x \leq \frac{l}{2} \\ l - x, & \text{for } \frac{l}{2} \leq x \leq l. \end{cases}$
6. **A rod of length l has its ends A and B kept at $0^{\circ}C$ and $100^{\circ}C$ until steady state condition prevail. If the temperature at B is reduced suddenly to $0^{\circ}C$ and kept so while that of A is maintained, find the temperature $u(x,t)$ at a distance x from A and at time t.**
7. **A bar, 10 cm long, with insulated sides, has its ends A and B kept at $20^{\circ}C$ and $40^{\circ}C$ respectively until steady state conditions prevail. The temperature at A is then suddenly raised to $50^{\circ}C$ and at the same instant that at B is lowered to $10^{\circ}C$. Find the subsequent temperature at any point of the bar at any time.**