



## UNIT – III APPLICATION OF PARTIAL DIFFERENTIAL EQUATIONS

### TUTORIAL 3

1. A uniform rod of length 50 cm with insulated sides is initially at a uniform temperature  $100^{\circ}\text{C}$ . Its ends are kept at  $0^{\circ}\text{C}$ . Find the temperature distribution.
2. A rod of 30cm long has its ends A & B at  $20^{\circ}\text{C}$  and  $80^{\circ}\text{C}$  respectively until steady state conditions prevail. The temperature at the end B is then suddenly reduced to  $60^{\circ}\text{C}$  and at the end at A is raised to  $40^{\circ}\text{C}$  and maintained so. Find the resulting temperature  $U(x, t)$ .
3. A rod of length  $l$  has its ends A & B kept at  $0^{\circ}\text{C}$  &  $100^{\circ}\text{C}$  respectively, until steady state conditions prevail. If the temperature at B is reduced to  $0^{\circ}\text{C}$  and kept so, while that of A is maintained, Find the temperature  $u(x,t)$  at a distance  $x$  from A at time  $t$ .
4. A metal bar 10 cm long with insulated sides has its ends A and B kept at  $20^{\circ}\text{C}$  &  $40^{\circ}\text{C}$  respectively until steady state conditions prevail. The temperature at A is then suddenly raised to  $50^{\circ}\text{C}$  and at the same instant that at B is lowered to  $10^{\circ}\text{C}$ . Find the subsequent temperature at any point at the bar at any time.