Q.1 Find the steady-state electric potential distribution, in a circular plate of radius R if the upper semicircular boundary is held at 100 volt and the lower at zero volt.

Q.2 Consider a semi-infinite plate of width π. Find the temperature distribution if the bottom edge is held at $T = T_0 \cos x$ and the others sides at zero temprature.

Q.3 Consider a square plate of length L on a side. Find the temperature distribution if the bottom edge is held at $T = T_0 \cos x$ and the others edges at zero temprature.

Q.4 Consider a semi-infinite plate of width π. Find the temperature distribution if the bottom edge is held at $T = f(x)$ and the others sides are insulated, that is $\frac{\partial T}{\partial x}$ vanishes along the vertical edges.

Q.5 Find the steady-state temperature distribution $T(x, y, z)$ in a semi-infinite solid square prism of side length L if the base is kept at the temperature $f(x, y)$ and the sides are insulated,
that is $\left.\frac{\partial T}{\partial x}\right|_{x=0} = \left.\frac{\partial T}{\partial x}\right|_{x=L} = \left.\frac{\partial T}{\partial y}\right|_{y=0} = \left.\frac{\partial T}{\partial L}\right|_{y=L} = 0.$

Q.6 Consider a quarter wedge of a circular plate of radius a in the first quadrant of the $x - y$ plane. The lateral sides of the plate are kept at zero temperature and the curved side is kept at the temperature $f(\theta) = T_0 \sin 2\theta$. Determine the steady-state temperature distribution $T(r, \theta)$ on the plate.

Q.7 Consider an elastic string of length L, whose end at $x = 0$ is held fixed while the end at $x = L$ is free. The string is set in motion from the initial position $f(x) = \sin \frac{3\pi x}{2L} + \sin \frac{5\pi x}{2L}$ with no initial velocity. Write down the initial conditions and find the vertical displacement $w(x, t)$ of the string at any time t.

Q.8 Consider a membrane whose shape is a quarter of a circle of radius R. The boundary of the membrane is kept fixed.The transverse vibrations of the membrane satisfy the wave-equation. If the membrane is given an initial displacement $w = w(r, \theta, t = 0) = f(r)$. Determine the general solution $w = w(r, \theta, t)$.