St. JOSEPH'S COLLEGE OF ENGINEERING, CHENNAI-119
St. JOSEPH'S INSTITUTE OF TECHNOLOGY, CHENNAI-119
DEPARTMENT OF MATHEMATICS

SUB NAME&CODE: MA6351 – TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS
ASSIGNMENT – II
UNIT III – APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

SEMESTER : III **(COMMON TO ALL BRANCHES)** **YEAR: II**

PART - A

1.	**State any two assumptions made in the derivation of the one dimensional wave equation.**
2.	**Write all possible solutions of the transverse vibration of the string in one dimension. (Apr/May2011) & (Nov/Dec 2011,2014)**
3.	**Classify the partial differential equation** $(1-x^2)z_{xx} - 2xy\,z_{xy} + (1-y^2)z_{yy} + xz_x + 3x^2yz_y - 2z = 0$ **(Nov/Dec 2014)**
4.	**State Fourier law of heat conduction.**
5.	**What are the various possible solutions of one dimensional heat flow equation? (Nov/Dec 2010,2015) & (May/June 2009)**
6.	**A plate is bounded by the lines *x=0,y=0, x=l* and *y=l*. Its faces are insulated. The edge coinciding with *x*-axis is kept at 100^{0}C. The edge coinciding with y-axis is kept at 50^{0}C. The other two edges are kept at 0^{0}C. Write the boundary conditions that are needed for solving two dimensional heat flow equation. (Nov/Dec2011,2012)**
7.	**Write down the three possible solutions of Laplace equation in two dimensions. /May2011) & (May/June2012)**
8.	**A rod 40 cm long with insulated sides has its ends *A* and *B* kept at 20^{0}C and 60^{0}C respectively. Find the steady state temperature at a location 15 cm from *A*. (Ap/May2011 & Nov/Dec2012)**

PART – B

1.	**A uniform string is stretched and fastened to two points '*l*' apart. Motion is started by displacing the string into the form of the curve** $y = kx(l-x)$ **and then releasing it from this position at time** $t = 0$**. Find the displacement of the point of the string at a distance** x **from one end at time** t**.**
2.	**The ends A and B of a rod *l* cm long have their temperatures kept at** $30^\circ C$ **and** $80^\circ C$**, until steady state conditions prevail. The temperature of the end B is suddenly reduced to** $60^\circ C$ **and that of A is increased to** $40^\circ C$**. Find the steady state temperature distribution in the rod after time t.**
3.	**If a string of length** l **is initially at rest in its equilibrium position whose ends are fixed and each of its points is given a velocity** v **such that** $v = \begin{cases} cx; & 0 < x < \frac{l}{2} \\ c(l-x); & \frac{l}{2} < x < l \end{cases}$**, find the displacement of the string at any time** t**.**
4.	**A rectangular plate with insulated surface is 20cm wide and so long compared to its width that it may be considered infinite in length without introducing appreciable error. The temperature at short edge** $x = 0$ **is given by** $u = \begin{cases} 10y, & 0 \le y \le 10 \\ 10(10-y), & 10 \le y \le 20 \end{cases}$ **and the two long edges as well as the other short edges are kept at** $0^\circ C$**. Find the steady state temperature distribution in the plate.**