NIET Greater Noida	**ENGINEERING MATHEMATICS III (AAS0301A) UNIT-III**	**SESSION: 2022-23**
		BRANCH: CSE/CS/IT SEM: III

Assignment Given Date: 16/11/22	Maximum Points: 78
Assignment Submission Date: 28/11/22	Weightage in University Exam: 30 Marks
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Note: Write solution of each question in clear handwriting.

Q.N.	Question Statement	Pts	CO	BLOOM'S KNOWLEDGE LEVEL
1	Solve the PDE: $r + 2s + t = 2(y - x) + \sin(x - y)$	10	3	K_5
2	Solve the PDE: $(D^2 + 2DD' + D'^2)z = 2\cos y - x\sin y$			
3	Solve: $(D^2 - DD' - 2D'^2 + 2D + 2D')z = e^{2x+3y} + \sin(2x + y) + xy$	10	3	K_5
4	Solve the PDE: $(3D^2 - 2D'^2 + D - 1)z = 4e^{x+y}\cos(x + y)$	10	3	K_5
5	Solve the PDE: $(D + D' - 1)^2 z = xy$	6	3	K_5
6	Classify the PDE: $y^2 u_{xx} - x^2 u_{yy} = 0$ in the first quadrant.	2	3	K_4
7	Solve the PDE $\frac{\partial u}{\partial t} = \frac{\partial u}{\partial x} - 2u$ subject to the condition $u(x, 0) = 10e^{-x} - 6e^{-4x}$ by method of separation of variables.	10	3	K_5
8	A homogeneous rod of conducting material length 100 cm has its end kept at zero temperature and the initial temperature is $u(x,0) = \begin{cases} x & 0 \le x \le 50 \\ 100 - x & 50 \le x \le 100 \end{cases}$ Find the temperature $u(x, t)$ at any time.	10	3	K_3, K_5
9	The vibrations of an elastic string are governed by the partial differential equation $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$. The length of the string is π and the ends are fixed. The initial velocity is zero and the initial deflection is $u(x, 0) = 2(\sin x + \sin 3x)$. Find the deflection $u(x, t)$ of the string for $t \ge 0$.	10	3	K_3, K_5
10	Find the solution of Laplace equation subject to the condition: $u(0, y) = u(1, y) = u(x, 0) = 0, u(x, 1) = 100\sin \pi x$	10	3	K_3, K_5

Solution:

1. $z = f_1(y-x) + xf_2(y-x) + x^2(y-x) - \frac{x^2}{2} sin\,(x-y)$
2. $z = f_1(y-x) + xf_2(y-x) + xsin\,y$
3. $z = f_1(y-x) + e^{-2x} f_2(y+2x) + \frac{1}{10} e^{2x+3y} - \frac{1}{6} cos\,(2x+y) + \frac{x^2 y}{4} - \frac{xy}{4} - \frac{x^3}{12} + \frac{3x^2}{8} - \frac{x}{2}$
4. $z = \sum Ae^{hx+ky} + \frac{4}{3} e^{x+y} \sin(x+y)\, where\ 3h^2 - 2k^2 + h - 1 = 0$
5. $z = e^x f_1(y-x) + xe^x f_2(y-x) + xy + 2y + 2x + 6$
6. **Hyperbolic**
7. $u(x,t) = 10e^{-(x+3t)} - 6e^{-2(2x+3t)}$
8. $u(x,t) = \frac{400}{\pi^2} \sum_{m=0}^{\infty} \frac{(-1)^m}{(2m+1)^2} sin\ \frac{(2m+1)\pi x}{100} e^{-\left[\frac{(2m+1)^2 \pi^2 c^2 t}{10000}\right]}$
9. $u(x,t) = 2[cos\ t\ sin\ x + cos\ 3t\ sin\ 3x$
10. $u(x,y) = 100 \sin \pi x \left(\frac{\sin h\pi y}{\sin h\pi}\right)$