SHRI RAMSWAROOP MEMORIAL UNIVERSITY
End Semester Examination (2021-22)-Odd Semester

M.Sc. (Mathematics) – I Year (I Sem)

Course Name: Differential Equations	Code: MMA1004
Time: 02 Hours	Max Marks: 60

University Roll No. [   ]

(To be filled by the Student)

Note: Please read instructions carefully:

   a) *The question paper has 03 sections and it is compulsory to attempt all sections.*

   b) *All questions of Section A are compulsory; questions in Section B and C contain choice.*

Section A: Very Short Answer type Questions Attempt all the questions.		BL	CLO	Marks (10)
1.	What is the Lipschitz condition?	BL1	CLO1	02
2.	Show that $y(x)_2 = x^2$, $y(x)_2 = e^x$ and $y(x)_3 = e^{-x}$ are linearly independent and find intervals.	BL2	CLO2	02
3.	Find the partial differential equation by eliminating constants $\emptyset(x + y + z,\ x^2 + y^2 - z^2) = 0$.	BL2	CLO2	02
4.	Define Abel's formula.	BL1	CLO3	02
5.	Identify the nature of one-dimensional Laplace equation.	BL2	CLO2	02
Section B: Short Answer Type Questions **Attempt any 03 out of 06 questions.**		BL	CLO	Marks (30)
1.	If $f(x, y) = \sqrt{|y|}$, show that with the initial condition $y = 0$ when $x = 0$ may not be unique.	BL2	CLO2	10
2.	Apply Picard's method to find the solution of the following initial value problem, $\frac{dy}{\partial x} = y - x,\ y = 2$, when $x = 0$. Show that iterative solution approaches the exact solution $1 + x + x^2$.	BL3	CLO2	10
3.	Using the method of separation of variables, solve $4\frac{\partial u}{\partial t} + \frac{\partial u}{\partial x} = 3u$ given $(0, t) = 3 exp(-x) - ex\, p(-5x)$.	BL3	CLO3	10
4.	Solve $(z^2 - 2yz - y^2)p + (xy + xz)q = xy - xz$.	BL3	CLO3	10
5.	Find the solution of differential equation by using variation of parameter, $y'' + 9y = secx$.	BL3	CLO2	10
6.	Solve completely the differential equation $xzp + yzq = xy$.	BL2	CLO3	10

Section C: Long Answer Type Questions Attempt any 01 out of 04 questions.		BL	CLO	Marks (20)
1.	Solve the system of differential equations $$\frac{d^2 y_1}{dx^2} - 2\frac{dy_2}{\partial x} + y_2 = 1$$ $$\frac{d^2 y_2}{dx^2} + 2\frac{dy_1}{\partial x} + y_1 - 4y_2 = 0$$	BL2	CLO3	20
2.	Find the surface which intersect the surface of the system $c(3z+1) = z(x+y)$ orthogonally and which passes through the circle $x^2 + y^2 = 1$, $z = 1$.	BL3	CLO3	20
3.	Derive an expression of heat equation and find the solution of boundary value problem $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$ with boundary conditions $u(0,t) = u(l,t)$ and $u(x,t) = 0$ when t is infinite	BL4	CLO4	20
4.	Describe Wronskian. If $y_1(x)$ and $y_2(x)$ are any two solutions of equation $y'' + P(x)y' + Q(x)y = 0$ on [a,b] then prove that they are linearly dependent on this interval if and only if their Wronskian $W = W(y_1, y_2)$ is identically zero.	BL2	CLO3	20