SHRI RAMSWAROOP MEMORIAL UNIVERSITY

End Semester Examination (2021-22)-Odd Semester

B.Tech.(CS,ME,EC,EE,CE) – I Year (I Sem)	
Course Name: Mathematics-I	Code: BMA1001
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.	Define Beta and Gamma functions.	BL1	CLO1	02
2.	State Lagrange's mean value theorem.	BL1	CLO1	02
3.	Show that the following matrix is unitary $A = \frac{1}{\sqrt{3}}\begin{bmatrix} 1 & 1+i \\ 1-i & -1 \end{bmatrix}$	BL2	CLO4	02
4.	Write $\epsilon - \delta$ definition for limit of a function with two variables.	BL1	CLO3	02
5.	State Cayley-Hamilton theorem.	BL1	CLO4	02
Section B: Short Answer Type Questions **Attempt any 03 out of 06questions.**		**BL**	**CLO**	**Marks (30)**
1.	If $u = x \log xy$ and $x^3 + y^3 + 3xy = 1$, find $\frac{du}{dx}$.	BL3	CLO3	10
2.	Verify Rolle's theorem for the function $f(x) = 2x^3 + x^2 - 4x - 2$ in $[-\sqrt{2}, \sqrt{2}]$	BL3	CLO3	10
3.	Obtain the directional derivative of $\phi = (x^2 + y^2 + z^2)^{-1/2}$ at the point P (3, 1, 2) in the direction of the vector $\vec{r}$.	BL5	CLO3	10
4.	Find the value of λ for which the vectors $(1, -2, \lambda), (2, -1, 5)$ and $(3, -5, 7\lambda)$ are linearly independent.	BL5	CLO4	10
5.	Using Maclaurin's theorem expand $\cos x$ in powers of x as far as the terms of third degree.	BL3	CLO1	10
6.	Find the value of $curl(\nabla r)$, where r is the magnitude of vector $\vec{r}$.	BL2	CLO3	10

Section C: Long Answer Type Questions. Attempt any 01 out of 04 questions.		**BL**	**CLO**	**Marks (20)**
1.	Find eigen values and eigen vectors of the given matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$	BL3	CLO4	20
2.	Find the dimension of box of maximum capacity, whose surface area is given.	BL5	CLO3	20
3.	Obtain the Fourier series for function $f(x) = x$ in the interval $[-\pi, \pi]$.	BL5	CLO2	20
4.	If $V = \frac{1}{\sqrt{x^2+y^2+z^2}}$, show that $x\frac{\partial V}{\partial x} + y\frac{\partial V}{\partial y} + z\frac{\partial V}{\partial z} = -V$.	BL3	CLO3	20
