SHRI RAMSWAROOP MEMORIAL UNIVERSITY

End Semester Examination (2021-22)-Odd Semester

M.Sc. (Physics) – I Year (I Sem.)	
Course Name: Mathematical physics-I	**Code: MPH1002**
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.	Write down the Cauchy-Riemann equation in polar form.	BL1	CLO1	02
2.	Expand log z in a Taylor's series about z = 1.	BL2	CLO2	02
3.	State Convolution theorem on Fourier transform.	BL1	CLO3	02
4.	Find the Laplace transform of Unit step function.	BL3	CLO3	02
5.	Define the basis for a vector space.	BL1	CLO3	02
Section B: Short Answer Type Questions **Attempt any 03 out of 05 questions.**		**BL**	**CLO**	**Marks (30)**
1.	Show that the following function is harmonic and find its harmonic conjugate. $v = \sinh x \cos y$	BL5	CLO1	10
2.	Calculate the value of $L\left[\int_0^\infty \frac{1}{t}\, e^{-2t} sint\right]$	BL5	CLO2	10
3.	Find the Fourier sine and cosine transforms of $f(x) = \begin{cases} 1, & 0 < x < a \\ 0, & x > a \end{cases}$	BL3	CLO3	10
4.	Show that row vectors of the matrix $\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$ are linearly independent.	BL5	CLO3	10
5.	Prove that the eigen values of symmetric second order tensor are real.	BL2	CLO4	10

Section C: Long Answer Type Questions **Attempt any 01 out of 04 questions.**		**BL**	**CLO**	**Marks (20)**
1.	Evaluate the following integrals by contour integration: $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos\theta} d\theta$	BL4	CLO1	20
2.	Examine for linear dependence [1, 0, 2, 1], [3, 1, 2, 1], [4, 6, 2, -4], [-6, 0, -3, -4] and find the relation between them, if possible.	BL5	CLO2	20
3.	Using the Laplace transform, find the solution of the initial value problem: $y''+25y = 10\cos 5t$ $y(0) = 2, y'(0) = 0$	BL3	CLO3	20
4.	Using Parseval's identity, prove that: $\int_0^{\infty} \left(\frac{\sin t}{t}\right)^2 dt = \frac{\pi}{2}$	BL5	CLO4	20
