SHRI RAMSWAROOP MEMORIAL UNIVERSITY

End Semester Examination (2021-22)-Odd Semester

B.Sc. (Hons.) Physics/Chemistry/Maths – I Year (I Sem)	
Course Name: Modern Algebra	Code: BMA1004
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 Equivalence class with example.	BL1	CLO1	02
2.	If $f: R \rightarrow R$ defined by $f(x) = 2x - 1$ then find $f^{-1}(x)$ and $f^{-1}\{35\}$.	BL2	CLO1	02
3.	Find the property of the permutation is even or odd. $$f = \begin{pmatrix} 5 & 6 & 7 & 8 \\ 6 & 7 & 8 & 5 \end{pmatrix}$$	BL3	CLO3	02
4.	Define Skew-Hermitian matrix and if A is Skew-Hermitian matrix then show that (iA) is a Hermitian matrix.	BL1	CLO2	02
5.	Write Gregory's Series when θ is an angle which lies between $-\frac{\pi}{4}$ to $\frac{\pi}{4}$.	BL1	CLO4	02
Section B: Short Answer Type Questions **Attempt any 03 out of 06 questions.**		**BL**	**CLO**	**Marks (30)**
1.	Let N be the set of natural numbers and let R be a relation on N defined by $$(a, b)R(c, d) \Leftrightarrow a + d = b + c$$ Show that R is an equivalence relation.	BL4	CLO1	10

		BL	CLO	Marks
2.	Find rank of matrix $$A = \begin{bmatrix} 2 & 3 & 4 & -1 \\ 5 & 2 & 0 & -1 \\ -4 & 5 & 12 & -1 \end{bmatrix}$$	BL5	CLO2	10
3.	Define cyclic group. Show that U_{10} is cyclic group and find its all generator.	BL1, BL3	CLO3	10
4.	State and Prove Lagrange's theorem.	BL1, BL3	CLO3	10
5.	Show that the characteristic roots of a unitary matrix are of unit modulus.	BL5	CLO2	10
6.	Find the roots of the equation $x^3 - 18x - 35 = 0$, by using Cardon's Method.	BL4	CLO4	10
Section C: Long Answer Type Questions/Case Study **Attempt any 01 out of 04 questions.**		**BL**	**CLO**	**Marks (20)**
1.	Determine the value of λ and μ such that the system of equations $$x + y + z = 6;\quad x + 2y + 3z = 10,\quad x + 2y + \lambda z = \mu$$ has (i) no solution (ii) Unique solution (iii) infinite solutions.	BL5	CLO2	20
2.	Show that the set of all positive rational numbers forms an abelian group under the composition defined by $$a * b = \frac{ab}{2}$$	BL3	CLO3	20
3.	Using Fermat's theorem, find the remainder when 8^{103} is divided by 13.	BL3	CLO3	20
4.	Using the principle of mathematical induction, prove that $a + ar + ar^2 + ar^3 + \ldots\ldots\ldots\ldots\ldots\ldots + ar^{n-1} = \frac{a(r^n - 1)}{(r-1)}$ for $r > 1$ and all $n \in N$.	BL3	CLO1	20
