LGS GROUP OF COLLEGES
A PROJECT OF LAHORE GRAMMAR SCHOOL

Sheet # ____

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Subject: Maths
Class: 11 A
Roll No. 06
Test No. Wk 5
Date: 23-11-2024

	A	B	C	D
1	○	○	●	○
2	○	●	○	○
3	○	○	○	●
4	●	○	○	○
5	○	○	○	○

Marks Obtained

Assignment :- (WK-5)

(i)

Semi Group:-

~~An~~ ~~a~~ semi group is an algebric structure consisting of a set equipped with an associative binary operation.

(ii)

The set of residue classes of modulo 5 is 0, 1, 2, 3, 4.

	0	1	2	3	4
0	0	0	0	0	0
1	0	1	2	3	4
2	0	2	4	1	3
3	0	3	1	4	2
4	0	4	3	2	1

3 **Identity Element:-**

The identity matrix I_2 satisfies $IA = AI = A$

4. **Inverse Element:-**

For every non-singular matrix A, there exists A^{-1} such that $AA^{-1} = A^{-1}A = I_2$.

5. **Non-Abelian Property:-**

Matrix multiplication is not commutative in general i.e $AB \neq BA$ for some matrices.

Sol:- $\begin{bmatrix} a_{11} & a_{13} \\ a_{21} & a_{22} \end{bmatrix}$ where $a, a_{11}, a_{12}, a_{13}, a_{22} \in R$ and

$\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \neq$

(i) Closure property:- $A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$ $B = \begin{bmatrix} b_{11} & b_{12} \\ b_{21} & b_{22} \end{bmatrix}$

$$AB = \begin{bmatrix} a_{11}b_{11} + a_{12}b_{21} & a_{11}b_{12} + a_{12}b_{22} \\ a_{21}b_{11} + a_{22}b_{21} & a_{21}b_{12} + a_{22}b_{22} \end{bmatrix}$$

Hence $AB \in M_2$

(ii) Associative

$\forall A, B, C, \in M_2 \Rightarrow A(BC) = (AB)C$

(iii) Identity element :- $I_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is 2x2 non

(iii)

$$A = \begin{bmatrix} i & 0 \\ 1 & -i \end{bmatrix}$$

To prove : A^2, then $A^4 =$

$$A^2 = A \cdot A = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} = -I_2$$

$$A^4 = (A^2)^2 = \cancel{I}1$$

$$\begin{bmatrix} (i)(i) + (0)(1) & (i)(0) + (0)(-i) \\ (1)(i) + (-i)(1) & (1)(0) + (-i)(-i) \end{bmatrix}$$

$$A^2 = \begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix} = I_2$$

$$A^4 = (A^2) \cdot (A^2) = (-I_2)(-I_2) = I_2$$

LONG Question

1 **Closure:-**

If A and B are 2x2 non-singular matrices, Their product AB is also 2x2 non singular.

2 **Associativity:-** Matrix multiplication is associative

$$(AB)C = A(BC)$$

singular.

$$I_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Inverse :- As inverse of non singular square matrix is again a non singular matrix such that $A \in M$, $\exists A^{-1}$ M_2, $= A_{r} A = I$