Discrete Structures

IIIT Hyderabad

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Tutorial 14

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Introduction

1. Questions
   - Question 1
   - Question 2
   - Question 3

Question 1

1.1: Construct Cayley table for

1. $S = \{EVEN, ODD\}, Op = +$.
2. $S = \mathbb{Z}_3, Op = \times$.

* $S = \{R_\theta, \theta = 60k\}$(rotation by multiples of 60 degrees) , $Op =$ Composition .

1.2: Let $G =< \mathbb{Z}_9^*, \times >$, find

1. e(identity)
2. 4^{-1}
3. 5×8
4. g (generator).

Recall that Z_N^* was the set of numbers co-prime to N.

Question 2

Show the following -

1. Let a group $G =< S, * >$, show that $(a * b)^{-1} = b^{-1} * a^{-1}$ if $a, b \in S$.
2. $(ab)^{-1} = a^{-1}b^{-1} \iff$ group is Abelian.
3. In a semi-group $G =< S, * >$, say if a is any element. For every element x , there are elements u, v such that

$$a * u = v * a = x$$

Show that there is an identity element in G.

Question 3

Use the following numbers for the next question -

1. Groupoid
2. Semi-group
3. Cyclic Semi-group
4. Monoid
5. Cyclic Monoid
6. Group
7. Cyclic Group
8. Quasi-Group

For the given sets and operations (Opn), mark the correct ticks. For all the cyclic groups, find the generators. -

Set	**Opn**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
$\mathbb{Z}_7$	$+$								
$\mathbb{Z}$	-								
$\mathbb{Z}_5^*$	^								
$\mathbb{Q} - \{0\}$	$\div$								
$\mathbb{Z}_{11}^*$	$\times$								
$\mathbb{Z}_{12}^*$	$\times$								
2×2 Matrices	$\times$								
2×2 Matrices	$+$								
$\mathbb{N}$	$\div$								
[*] Reflection lines in n-gon	Composition								