



DEPARTMENT OF MATHEMATICS, SCHOOL OF ADVANCED SCIENCES

Digital Assignment-1

BMAT205L Discrete Mathematics and Graph Theory

Fall Semester 22-23

Answer all the question

1. Determine all possible non trivial subgroups of $(\mathbb{Z}_4, +_4)$ and find its left and right cosets.
2. Show that the mapping $g: (\mathbb{Z}_4, +_4) \rightarrow (\mathbb{Z}_5^*, \times_5)$, given by $g([0])=[1]$, $g([1])=[2]$, $g([2])=[4]$ and $g([3])=[3]$ is a homomorphism where $\mathbb{Z}_5^* = \mathbb{Z}_5 - \{[0]\}$.

3. Given a parity check matrix
$$\begin{pmatrix} 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 & 1 \end{pmatrix}$$
 of an encoding function $e: \mathbb{B}^3 \rightarrow \mathbb{B}^5$.

Determine all code words and decode the words (i) 11101 (ii) 00101 (iii) 10100.

4. Find all possible subgroups of $(\mathbb{Z}_9, +_9)$ and find its left and right cosets.
5. Give examples to verify, union of all left cosets is its group.
6. State the converse of Lagrange's theorem and state whether the converse is true and justify