



VIT[®]
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ADVANCED SCIENCES

Fall Semester 2023-2024

Continuous Assessment Test – I

Programme Name & Branch: B.Tech (CSE and Business Systems)

Slot: D1+TD1

Course Name & code: Discrete Mathematics & MAT1004

Class Number (s): VL2023240106393, VL2023240106390

Faculty Name (s): Dr. Parthiban A, Dr. Niranjana H

Exam Duration: 90 Min.

Maximum Marks: 50

General instruction(s): Answer all the questions.

Q.No.	Question	Max Marks
1.	Define an abelian group. If $*$ is defined on R such that $a * b = a + b - ab$, for $a, b \in R$, verify that $\{R, *\}$ is an abelian group.	10
2.	Find the number of integers between 1 and 1000 (both inclusive) that are divisible by 2, 3, 5, or 7.	10
3.	Determine whether the following relations are reflexive, symmetric, and/or transitive: (a) R_1 is the relation on the set of real numbers such that aR_1b if and only if $(a - b)$ is an integer. (b) R_2 is the relation on the set of integers such that aR_2b if and only if $a \geq b^2$. (c) R_3 is the relation on the set $\{1, 2, 3, \dots, 10\}$ defined by aR_3b if $a + b < 7$.	10
4.	(a) If Q is the set of rational numbers and $*$ is the operation on Q defined by $a * b = a + b - ab$, show that $\{Q, *\}$ is a commutative semi group. Find also the identity element if it exists. (b) If R is the set of real numbers and $*$ is the operation defined by $a * b = a + b + 3ab$, where $a, b \in R$, show that $\{R, *\}$ is a commutative monoid. Which elements have inverses and what are they?	10
5.	Define integral domain and field. Also, give answers to the following questions with justifications: a) Is Z_{21} an integral domain? b) Is every field an integral domain?	10