

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
SCHOOL OF ADVANCED SCIENCES
FALL SEMESTER 2024-2025
CONTINUOUS ASSESSMENT TEST – I

Programme Name & Branch : B.Tech & Computer Science and Engineering and Business Systems
 Course Code : MAT1004
 Course Name : Discrete Mathematics
 Slot : G1+TG1
 Class Number(s) : VL2024250106378/6381
 Duration : 90 minutes

Max. Marks : 50

General instruction(s): Answer All Questions

Q. No	Question	Marks
1.	If A, B and C are sets, prove, both analytically and graphically, that $(A - B) - C = (A - C) - (B - C)$.	10
2.	In the Faculty of Arts and Science, the voting method used is “approval;” that is, regardless of the number of positions available, each voter can mark as many boxes as they wish on their ballot. Imagine that Prof. Li, Prof. Cheng, and Prof. Osborn were all nominated for two computer science positions on the department’s search committee. Barb Hodgson notes the following facts when counting the ballots: Prof. Cheng received 18 votes; Prof. Osborn received 15 votes, and Prof. Li received 10 votes. Only one ballot had all three boxes marked. Five of the ballots were marked for both Prof. Osborn and Prof. Li. Ten of the ballots were marked for Prof. Cheng and Prof. Osborn. Six of the ballots were marked for Prof. Cheng and Prof. Li. i. How many members of the department voted in the election? ii. How many members of the department voted only for Prof. Cheng but not for others in the election?	10
3.	i. If $f: R - \{3\} \rightarrow R - \{1\}$ is defined by $f(x) = \frac{x-2}{x-3}$ determine f is invertible and if so, determine f^{-1}. [5] ii. If R is a relation on Z defined by aRb if and only if $3a + b$ is multiple of 4, prove that R is an equivalence relation. [5]	10
4.	If * is defined on the set of real numbers R such that $a * b = a + b - ab$, for all $a, b \in R$, verify that if $\langle R, * \rangle$ is an abelian group.	10
5.	Define a subgroup. Also prove that a subset $S \neq \phi$ of G is a subgroup of $\langle G, * \rangle$ if and only if for any pair of elements $a, b \in S$, $a * b^{-1} \in S$.	10
