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

REG.NO.:

SLOT: C2 + TC2 + TCC2

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2025-2026

Programme Name & Branch : **BTech (SCOPE)**
Course Code and Course Name : **BMAT205L Discrete Mathematics and Graph Theory**
Faculty Name(s) : **Common slot**
Class Number(s) : **Common slot**
Date of Examination : **07.10.2025**
Exam Duration : **90 minutes** **Maximum Marks: 50**

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
  Course Outcomes:
  CO2 – Use algebraic structures in applications
  CO3 – Counting techniques in engineering problems
  CO4 – Use lattice and Boolean algebra properties in digital circuits

Q. No	Question	M	CO	BL
1.	a) Show that there are exactly two group homomorphisms from $(\mathbb{Z}_2, +_2)$ to $(\mathbb{Z}_6, +_6)$.	5	2	2
	b) Find the generator matrix corresponding to the $(2,3)$ even parity check encoding function. Justify.	5		
2.	Let $n \in \mathbb{N}$, and $S = \{1, 2, \dots, 2n\}$ be given. Show that n is the largest possible cardinality of a subset $A \subseteq S$ satisfying the condition: given $a, b \in A$ such that $a \neq b$, then a does not divide b and b does not divide a.	10	3	3
3.	How many non-negative integer solutions exist for the equation $x_1 + x_2 + x_3 + x_4 = 23$, where $x_1, x_2, x_3 \geq 0$ and $x_4 \geq 3$?	10	3	3
4.	Solve the recurrence relation $a_n = 3a_{n-1} + 1$, for $n \geq 1$, $a_0 = 2$.	10	3	2
5.	Let A be the set of all 3-bit strings. Let $x_1x_2x_3, y_1y_2y_3 \in A$. Define a binary relation R on A by: $x_1x_2x_3 R y_1y_2y_3 \Leftrightarrow \forall i \in \{1,2,3\}, x_i \leq y_i$. Is (A, R) a poset? Justify. Does it form a lattice? Justify.	10	4	2