



VIT<sup>®</sup>

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

WINTER SEMESTER 2022-2023

SCHOOL OF ADVANCED SCIENCES

DEPARTMENT OF MATHEMATICS

CONTINUOUS ASSESSMENT TEST – II

Course Code : BMAT205L  
 Course Name : Discrete Mathematics and Graph Theory  
 Slot : A1+TA1+TAA1  
 Duration : 90 Minutes  
 Date : 12.03.2023 Max. Marks: 50

Answer ALL the following questions.

Q. No.	Question	Marks	CO	BL
1.	a) Show that if every element in a group is its own inverse, then the group must be abelian. (5 Marks) b) Show that the set of all elements $a$ of a group $(G,*)$ such that $a * x = x * a$ for every $x \in G$ is a subgroup of $G$ . (5 Marks)	10	[CO2]	BL3
2.	a) Let $(G,*)$ be a group and $a \in G$ . Let $f: G \rightarrow G$ be given by $f(x) = a * x * a^{-1}$ for every $x \in G$ . Prove that $f$ is an isomorphism of $G$ onto $G$ . (5 Marks) b) Find the code words generated by the encoding function $e: B^3 \rightarrow B^6$ with respect to the parity check matrix $\begin{pmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 \end{pmatrix}$ (5 Marks)	10	[CO2]	BL4
3.	a) How many positive integers between 1000 and 9999 inclusive are divisible by 5 but not by 7? (5 Marks) b) How many different ways are there to choose 3 coins from the collection of Rs 1 coins, Rs 2 coins, Rs 5 coins and Rs 10 coins? Assume that there are at least 3 coins of each denomination. (5 Marks)	10	[CO3]	BL2
4.	Solve by using generating functions $a_n - 3a_{n-1} = n, n \geq 1, a_0 = 1$	10	[CO3]	BL5
5.	Draw the Hasse diagram for Poset $\langle \{2,4,6,9,12,18,27,36,48,60,72\}, divides \rangle$ . Find maximal and minimal elements, least and greatest element, upper bounds and lub of $\{2,9\}$ , lower bounds and glb of $\{60,72\}$ .	10	[CO4]	BL3