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

Reg. Number:	

Continuous Assessment Test (CAT) – I AUGUST 2025

Programme	:	B.Tech.	Semester	:	FALL SEMESTER 2025-26
Course Code & Course Title	:	BMAT205L, Discrete Mathematics and Graph Theory	Class Number	:	CH2025260100780, CH2025260100776, CH2025260100868, CH2025260100777, CH2025260100781, CH2025260100867, CH2025260100864, CH2025260100870, CH2025260100772, CH2025260100865, CH2025260100774
Faculty	:	Dr. R. Pavithra, Dr. S. Devi Yamini, Dr. Pulak Konar, Dr. Ashish Kumar Nandi, Dr. Surath Ghosh, Dr. Basua Debananda, Prof. S. Vaishnavi, Prof. C. Yuvarani, Dr. D. Nivedha, Prof. G. Anitha, Dr. R. Kiruthika	Slot	:	D2+TD2+TDD2
Duration	:	90 minutes	Max. Mark		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	CO	BT Level
1.	a.	Symbolize the statements using propositions and/or predicates. i) Not all mangoes are sweet. Some mangoes are sour. ii) He goes either to the theatre or to the hotel, but never to the park.	4	1	K3
	b.	Without using truth table, show that $[(p \to q) \wedge (r \to s)] \wedge [(q \to t) \wedge (s \to w)] \wedge [\sim(t \wedge w) \wedge (p \to r)] \to (\sim p)$ is a tautology.	6	1	K4
2.	a.	Construct the truth table for the following proposition: $(p \to (q \to s)) \wedge (\sim r \vee p) \wedge q$.	4	1	K3
	b.	Show, by indirect method of proof, that $\forall x\,(p(x) \vee q(x)) \Rightarrow (\forall x p(x)) \vee (\exists x\, q(x))$.	6	1	K3

3.	a.	If α and β are elements of the symmetric group S_4, given by $\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 3 & 4 & 2 & 1 \end{pmatrix}$ and $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 3 & 1 \end{pmatrix}$, then find $\alpha^2\beta$ and $\alpha\beta^2$. Also, find $O(\alpha)$ and $O(\beta)$.	5	2	K4
	b.	Verify whether $H = \{-1,1\}$ is a subgroup of a group $G = \{1,-1,i,-i\}$ under usual multiplication. Find all the cosets of H and the number of distinct left cosets of H in G.	5	2	K4
4.	a.	Given the generator matrix $G = \begin{pmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 & 1 \end{pmatrix}$, corresponding to the encoding function $e: B^4 \to B^7$, find the corresponding parity check matrix and use it decode the received words 1100001 and 1110111 to determine the original message for each decoded word.	6	2	K4
	b.	Consider the following Cayley's table for the set G under an operation $*$: (i) Find the identity element, if it exists. (ii) Find the inverse of every element, if it exists. (iii) Find an element $x \in G$ such that $d * x * c = f$.	4	2	K3
5.	a.	Let A= {1,2,3…9}. (a) How many subsets of A contain exactly 5 elements? (b) How many subsets of A are there? (c) How many subsets of A contain only even numbers?	5	3	K3
	b.	(a) In how many ways can eight different books be arranged on a shelf? (b) In how many ways can four of eight different books be arranged on a shelf? (c) In how many ways can eight different books be arranged on two shelves so that each shelf contains four books?	5	3	K3

$*$	e	a	b	c	d	f
e	e	a	b	c	d	f
a	a	e	d	f	b	c
b	b	c	e	a	f	d
c	c	b	f	d	e	a
d	d	f	a	e	c	b
f	f	d	c	b	a	e

**********All the best **********