Reg. Number:	

VIT

Vellore Institute of Technology

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

CHENNAI

Continuous Assessment Test (CAT) – I August 2024

Programme	:	**B.Tech.**	Semester	:	**FALL 2024-2025**
Course Code & Course Title	:	**BMAT205L Discrete Mathematics and Graph Theory**	Slot	:	**C1+TC1+TCC1**
Faculty	:	**Sakthidevi K. Pavithra R. Anitha G. Gnanaprasanna K. Aarthy B. Sumathi S.**	Class Number	:	**CH2024250102262 CH2024250102263 CH2024250102264 CH2024250102081 CH2024250102064 CH2024250102065**
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
1.	(a)	Without constructing truth table, find the principal conjunctive normal form of $(p \to (q \wedge r)) \wedge (\sim p \to (\sim q \wedge \sim r))$.	(5)
	(b)	Derive $a \to (b \to d)$ using the Rule of Conditional Proof (CP-rule) from the premises $a \to (\neg b \vee c)$ and $b \to (c \to d)$	(5)
2.	(a)	Show that the hypotheses "If you send me an e-mail message, then I will finish writing the program", "If you do not send me an e-mail message, then I will go to sleep early", and "If I go to sleep early, then I will wake up feeling refreshed" lead to the conclusion "If I do not finish writing the program, then I will wake up feeling refreshed."	(5)
	(b)	Determine whether these system specifications are consistent: "The diagnostic message is stored in the buffer or it is retransmitted", "The diagnostic message is not stored in the buffer", "If the diagnostic message is stored in the buffer, then it is retransmitted".	(5)
3.	(a)	Show that the premises "A student in this class has not read the book," and "Everyone in this class passed the first exam" imply the conclusion "Someone who passed the first exam has not read the book"	(6)
	(b)	Show that q can be derived from the premises using indirect method $p \to q, r \to q, s \to (p \vee r)$.	(4)
4.	(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 $\beta = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 3 & 1 \end{pmatrix}$. Find $\alpha\beta, \beta\alpha$ and α^{-1}.	(3)
	(b)	Obtain all the distinct left cosets of $\{[0], [3]\}$ in the group $(Z_6, +_6)$.	(2)

	(c)	If $S = N \times N$, the set of ordered pairs of positive integers with operation $*$ defined by $(a, b) * (c, d) = (ad + bc, bd)$. Show that $(S, *)$ is a semigroup. And, if $f: (S, *) \rightarrow (Q, +)$ is a function defined by $f(a, b) = \frac{a}{b}$, show that f is homomorphism.	(5)
5	(a)	Find the code words generated by the encoding function $e: B^2 \rightarrow B^5$ with respect to the parity check matrix $H = \begin{bmatrix} 0 & 1 & 1 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$.	(6)
	(b)	Prove that the set $G = \{1, 2, 3, 4\}$ is abelian group with respect to ordinary multiplication modulo 5.	(4)

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