VIT

Vellore Institute of Technology

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

Reg.No.:

Name:

Continuous Assessment Test – September 2023

Programme	:	B.Tech.	Semester	:	Fall 2023-24
Course	:	Discrete Mathematics and Graph Theory	Code	:	BMAT205L
Faculty	:	Dr. Berin Greeni A Dr. Jayagopal R Prof. Aarthy B Prof. Vignesh R Prof. Anitha G Prof. Sumathi S Prof. Sakthidevi K Prof. Gnanaprasanna K	Class ID's	:	CH2023240101195 CH2023240101047 CH2023240101191 CH2023240101192 CH2023240101193 CH2023240101195 CH2023240101196 CH2023240101197 CH2023240101198
			Slot	:	D1+TD1+TDD1
Duration	:	90 minutes	Max. Marks	:	50

Answer all the questions ($5 \times 10 = 50$ *Marks*)

Q. No.	Question Description	Marks
1.	a) Show that $\forall x(P(x) \vee Q(x))$ implies the conclusion $\forall xP(x) \vee \exists xQ(x)$ using the method of contradiction.	5
	b) Find the generator matrix and parity check matrix corresponding to the encoding function $e: B^3 \to B^6$ given by $e(000) = 000000, e(001) = 001101, e(010) = 010011,$ $e(100) = 100110, e(011) = 011110, e(101) = 101011, e(110) = 110101$ and $e(111) = 111000$.	5
2.	a) Show that the following argument is valid. If today is Wednesday, I have a test in Mathematics or Economics. If my Economics Professor is sick, I will not have a test in Economics. Today is Wednesday and my Economics Professor being sick. Therefore, I have a test in Mathematics.	7
	b) Identify the bound variable, free variable and the scope of the following expression $\forall x\exists y(P(x,y) \wedge Q(x,y)) \vee \forall y(R(x,y) \to S(x,y)) \wedge M(x,y)$.	3
3.	a) Without using the truth table find the PCNF of $(\neg P \to R) \wedge (Q \leftrightarrow P)$.	5
	b) Without using the truth table prove that the premises $P \to Q, P \to R, Q \to \neg R$ and P are inconsistent.	5
4.	a) Let $G = \{(a,b) \mid a,b \in \mathbb{R},\ a \neq 0\}$ and $*$ be a binary operation defined on G such that $(a,b) * (c,d) = (ac, bc + d)$ for all $(a,b),(c,d) \in G$. Examine if $(G,*)$ is a commutative group.	6
	b) Let $G = \left\{\begin{pmatrix} a & b \\ -b & a \end{pmatrix} : a,b \in \mathbb{R}\right\}$ be a group with respect to matrix addition and $(\mathbb{C},+)$	

be another group. Check whether the following mapping $f: (G, +) \to (\mathbb{C}, +)$, where $\mathbb{C}$ is the set of complex numbers, defined by $f\begin{pmatrix} a & b \\ -b & a \end{pmatrix} = a + i\,b$, is a group homomorphism or not. 4

5. a) If 20 processors are interconnected and every processor is connected to at least one other, show that at least two processors are directly connected to the same number of processors. 5

b) In how many ways can 7 people be arranged about a circular table? If two of them insist on sitting next to each other, how many arrangements are possible? 5

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