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

Reg. Number:	

Continuous Assessment Test (CAT) – II October 2024

Programme	:	**B.Tech.**	Semester	:	**FALL 2024-2025**
Course Code & Course Title	:	**BMAT205L Discrete Mathematics and Graph Theory**	Slot	:	**C2+TC2+TCC2**
Faculty	:	**Prof. Aarthy B** **Dr. Amit Kumar Rahul** **Prof. Anitha G** **Dr. Ankit Kumar** **Dr. Padmaja N** **Dr. Poulomi De** **Dr. Surath Ghosh**	Class Number	:	**CH2024250102066** **CH2024250102265** **CH2024250102267** **CH2024250102069** **CH2024250102266** **CH2024250102068** **CH2024250102268**
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.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions
(5×10=50)

Q. No	Sub Sec	Description	Marks
1.		How many bit strings of length 8 contain either 3 consecutive 0's or 4 consecutive 1's or both?	[10]
2.		Let R_n represents the number of regions that a plane is divided into by n lines such that no two of the lines are parallel and no three of the lines go through the same point. (i) Form an equation that defines a sequence based on the previous terms with the initial conditions. (ii) Solve the equation by generating function. (iii) Find the number of regions divided by 20 lines under the given condition.	[10]
3.		A set S is defined as $S = \{1,3,5,9,15,25,30,45\}$. A relation R is defined on S such that aRb if and only if "a divides b". (i) Prove that R is a partial order relation [2 marks] (ii) Is R a total order relation [1 mark] (iii) Draw the Hasse diagram of the poset [3 marks] (iv) Hence draw the Hasse diagram of dual of R [1 mark] (v) Find the infimum of $\{3,5,15,30\}$ [1 mark] (vi) Find the supremum of $\{3,5,25,30\}$ [1 mark]	[10]

		(vii) Find the supremum of {5,9} [1 mark]	
4.	(a)	Consider the poset $X = \{(1,1),(1,2),(1,3),\ldots\} \cup \{(2,1),(3,1),(4,1),\ldots\}$ with the partial order $f = \bigcup_{\substack{m,n\in N \\ m\le n}} \{((1,m),(1,n))\} \cup \bigcup_{\substack{m,n\in N \\ m\le n}} \{((m,1),(n,1))\}$, where N is set of natural numbers. (i) Does X have any minimal element(s)? (ii) Does every subset of X have a lower bound? (iii) What type of nonempty subsets of X always have a minimum?	[2+2+1]
	(b)	Find the disjunctive normal form (DNF) and conjunctive normal form (CNF) of the following Boolean expression $f(x,y,z) = y' + [z' + x + (yz)'](z + x'y)$	[3+2]
5	(a)	Draw a picture of the following graph and state whether it is simple or not. Also determine the degree of every vertex of the graph. G1 = (V1, E1), where V1 = {a, b, c, d, e} and E1 = {{a, b}, {b, c}, {a, c}{a, d}, {a, e}}	[2]
	(b)	Is it possible to get a simple graph with the following degree sequence? If yes, then draw the graph and if no, the draw the multigraph. {7, 4, 4, 3, 3, 3}	[2]
	(c)	Consider a graph with 12 vertices and 36 edges. Each vertex has degree 4 or 7. How many vertices of degree 4 and 7 does the graph have?	[3]
	(d)	Suppose that in a group of 5 people: A, B, C, D, and E, the following pairs of people are acquainted with each other. (i) A and C (ii) A and D (iii) B and C (iv) C and D (v) C and E. Write an adjacency and incidence matrix for G.	[3]

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