Reg. No.:

Name :

VIT

Vellore Institute of Technology

CHENNAI

Continuous Assessment Test (CAT- II) – JUNE 2023

Programme	: B. Tech		Semester	:	Fall Inter Semester 2022-23
Course	: Discrete Mathematics and Graph Theory		Code	:	BMAT205L
Faculty	: Dr. Kalyan Manna, Dr. Avinash Kumar Mittal, Dr. Durga Nagrajan, Dr. Vidhya V, Dr. Devi Yamini S, Dr. Om Namah Shivay, Dr. Uma Maheswari S, Dr. Rajesh Kumar Mohapatra, Dr. Manigandla Prasannalakshmi, Dr. Sandip Dalui, Dr. Pulak Konar, Dr. Surath Ghosh,Dr. Lakshmanan S		Slot(s)	:	C1+TC1+TCC1
			Class Id	:	CH2022232500280 - CH2022232500287, CH2022232500292 - CH2022232500297
Time	: 90 Minutes		Max. Marks	:	50

Answer ALL the Questions (5 X 10 = 50 Marks)

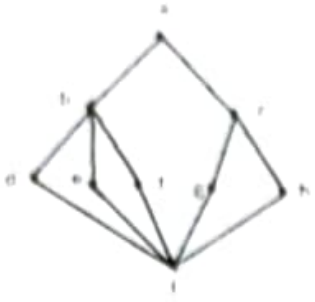
Q.No.	Sub. Sec.	Question Description	Marks
1.	a.	The number plates of cars must contain 3 letters of the alphabet denoting the place and area to which its owner belongs. This is to be followed by a three-digit number. How many different number plates can be formed if: (i) Repetition of letters and digits is not allowed. (ii) Repetition of letters and digits is allowed.	5
	b.	(i)Kyle wants to buy coffee and a doughnut. The local doughnut shop has five kinds of doughnuts for sale and sells four varieties of coffee in three sizes (as shown in the table).	2+3

	Small	Medium	Large
Latte	small latte	medium latte	large latte
Mocha	small mocha	medium mocha	large mocha
Espresso	small espresso	medium espresso	large espresso
Cappuccino	small cappuccino	medium cappuccino	large cappuccino

How many different orders could Kyle make?

(ii) Jasmine is holding three cards from a regular deck of playing cards. She tells you that they are all hearts, and that she is holding at least one of the two highest cards in the suit (Ace and King). If you wanted to list all of the possible sets of cards she might be holding, how long would your list be?

2.		Using the method of undetermined coefficients, solve the recurrence relation. $a_{n+2} - 6a_{n+1} + 5a_n = 1 + n + 5^n, n \geq 0$ *with* $a_0 = 1; a_1 = 1$	10
3.	a.	(i)Prove that $(a + b') \cdot (b + c') \cdot (c + a') = (a' + b).(b' + c).(c' + a)$ (Using Boolean laws)	3+2
		(ii)Simplify the Boolean expression: $ab + abc + a'b + ab'c$	
	b.	Prove that the following Hasse Diagram represents a Lattice.	



5

Also, check whether the lattice is (a) complemented or not (b) distributive or not.
(Justification required for each part)

4. Consider the set $A = \{\{1\}, \{2\}, \{5\}, \{1,2\}, \{1,5\}, \{2,5\}, \{3,5\}, \{1,3,5\}, \{2,3,5\}\}$ with subset $\subseteq$ as the relation.

(a) Prove that $(A, \subseteq)$ is a POSET.
(b) Draw the Hasse diagram.
(c) Find the minimal, maximal, greatest, least element if it exists.
(d) Find the upper bounds and least upper bound of $\{\{2\},\{5\}\}$, if it exists.
(e) Find the lower bounds and greatest lower bound of $\{\{1,3,5\},\{2,3,5\}\}$ if it exists.

10

5. a. For the given incidence matrix

	v_1	v_2	v_3	v_4	v_5	v_6	v_7
e_1	0	0	0	0	0	1	1
e_2	0	1	0	1	0	0	1
e_3	0	0	0	1	1	0	0
e_4	0	0	0	1	1	0	0
e_5	0	0	0	0	0	0	1
e_6	1	0	0	1	0	0	0
e_7	0	0	0	0	0	1	1
e_8	0	0	0	1	0	1	0

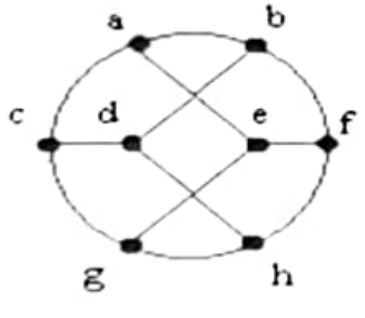
4

Identify the following.

(i) Isolated vertices
(ii) Pendant vertices

(Justification required for each case)

b. (i)Check whether the degree sequence (6, 4, 3, 3, 2, 1, 1, 0) constitute a simple graph, if so, draw the graph, if not, add or delete exactly one vertex to make it a simple graph.
(ii) Check whether the following graph is planar. (Justification required)



4+2