Reg. No.: [redacted]

Name :

VIT

Vellore Institute of Technology

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

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
			Slot	:	C2+TC2+TCC2
Faculty	:	Dr. Om Namha Shivay, Dr. Kalyan Manna, Dr. Avinash Kumar Mittal, Dr. Durga Nagarajan, Dr. Vidhya V, Dr. Devi Yamini S, Dr. Uma Maheswari S, Dr. Rajesh Kumar Mohapatra, Dr. Manigandla Prasannalakshmi, Dr. Amit Kumar Rahul, Dr. Biswajit Mallick, Dr. Lakshmanan S	Class ID		CH2022232500303, CH2022232500293, CH2022232500294, CH2022232500295, CH2022232500296, CH2022232500297, CH2022232500299, CH2022232500300, CH2022232500298, CH2022232500301, CH2022232500302, CH2022232500304
Time	:	90 Minutes	Max. Marks	:	50

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

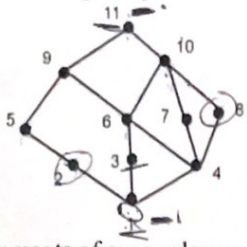
Q.No.	Sub. Sec.	Question Description	Marks
1.	a.	Quality control in a factory pulls 40 parts with paint, packaging, or electronics defects from an assembly line. Of these, 28 had a paint defect, 17 had a packaging defect, 13 had an electronics defect, 6 had both paint and packaging defects, 7 had both packaging and electronics defects, and 10 had both paint and electronics defects. Did any part have all three types of defects?	7
	b.	Ten students solved a total of 35 problems in a Global math Olympiad. Each problem was solved by exactly one student. There is at least one student who solved exactly one problem, at least one student who solved exactly two problems and at least one student who solved exactly three problems. Prove that there is also at least one student who solved at least five problems.	3
2.		Using the method of generating function, solve the recurrence relation. $a_{n+1} - 2a_n + a_{n-1} = 1, n \geq 1 \; with \; a_0 = 1; a_1 = 2$	10
3.		Let D_{30} be the set of all divisors of 30 and any two elements $a, b \in D_{30}$ are related (that is $(a, b) \in R$) if $a \; divides \; b$. (a) Write the elements in the relation R explicitly. (b) Draw the Hasse diagram.	10

(c) Find the maximal, minimal, greatest, least elements for the above relation.

(d) Does this Hasse diagram represent a lattice? Justify.

(e) Draw the dual lattice.

4. a. For the Hasse diagram given below, find the following:



(i) Complements of every element

(ii) Distributive or not (justification required)

(iii) GLB and LUB of {4,5,10} if it exists.

b. Prove that $(A+B).(A+A'B').C+\left(A'.(B+C')\right)'+A'B+A'BC=A+B+C$ (Using Boolean laws and theorems) 4

5. a. A situation is explained as follows there are some people in a village which they may or may not relate to each other. We can assume that if "a" is related to "b" then "b" is related to "a", but if a is related to" b" and "b" is related to "c" not necessary that "a" is related to "c". Some people may not have relatives.

(i) Depict the above situation as a graph.

(ii) Draw a graph for the above model consisting of 10 people in which 6

(a) one of them has no relative

(b) 4 of them have exactly one relative

(c) 2 of them have 2 relatives.

(d) 2 of them have 3 relatives.

b. Check whether the degree sequence (4, 3, 3, 3, 2, 2, 2, 1) constitute a simple graph, if so, draw the graph, if not, add or delete exactly one vertex to make it a simple graph. 4