Q/K/TY

Reg. No:

Final Assessment Test – November 2025

VIT
Vellore Institute of Technology

Course: BMAT205L - Discrete Mathematics and Graph Theory

Class NBR(s): 0864 / 0869 / 0872 / 0889 / 0893 / 2452 / 4418

Slot: A1+TA1+TAA1

Time: Three Hours

Max. Marks: 100

- KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

COs	CO Statements
CO1	Learn proof techniques and concepts of inference theory
CO2	Use algebraic structures in applications
CO3	Counting techniques in engineering problems.
CO4	Use lattice and Boolean algebra properties in Digital circuits.
CO5	Solve Science and Engineering problems using Graph theory.

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

Answer ALL Questions

(10 X 10 = 100 Marks)

1. Consider the following argument : CO1 BL3

The system will generate reports only if the server is active or the backup is online. Whenever the server is active, the database responds. The database did not respond.

Using the method of indirect proof, prove that the system did not generate reports.

2. Prove that the following premises are inconsistent. CO1 BL3

Every student who applies for a scholarship and meets the eligibility criteria will either be shortlisted or informed of rejection. Any student who is shortlisted receives an official email. There exists at least one student who applies for a scholarship, meets the eligibility criteria, and is not informed of rejection. No student receives any official email.

3. Consider a set $G = \mathbb{C} \setminus \{0\}$, where $\mathbb{C}$ is the set of all complex numbers. CO2 BL3
Define $a * b = \frac{ab}{|ab|}$. Verify if G forms a group or not under the operation '*'.

4. Consider the group coding function $e: B^2 \to B^4$ defined by CO2 BL3
$e(00) = 0000, e(10) = 1001, e(01) = 0111$ and $e(11) = 1111$.
Decode the following words (a) 0011 (b) 1011 (c) 1111

5.a) In a 6 × 6 table, 19 cells are selected. CO3 BL3

i) Show that there is at least one row or column with at least 4 selected cells.

ii) Determine the maximum possible number of selected cells in a row if the number of selected cells in each column is at most 3.

OR

5.b) Using generating functions, solve the recurrence relation CO3 BL3
$a_{n+2} - 3a_{n+1} + 2a_n = 0, n \geq 0$ with initial conditions $a_0 = 1, a_1 = 2$.

6. Define Distributive Lattice. State and prove Distributive inequalities

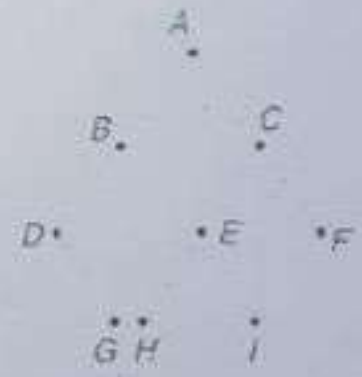
7. Simplify the following Boolean expressions : CO4 BL2

   i) $f(x,y,z,w,v) = xyz + xyz + x\bar{y}z + \bar{x}yz + xyz\bar{w}$ CO4 BL3

   ii) $f(x,y,z,w) = xy + \bar{x}z + xw + y\bar{z}w$

8. Prove that a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges CO5 BL3

9.a) List the order in which the vertices of the following tree will be processed in inorder, preorder, and post order traversal CO5 BL3



Also, construct the binary trees whose inorder and preorder traversal is as follows :

Inorder : HDIBEAFCG

Preorder : ABDHIECFG

Inorder : QBAGCPEDR

Preorder : GBQACPDER

OR

9.b) Find the minimum spanning tree for the following graph using Kruskal's algorithm CO5 BL3

10. Find the chromatic number and chromatic polynomial of the graph $K_{3,2}$. CO5 BL3

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