R/K/TY

Reg. No:

Final Assessment Test – November 2025

VIT® Vellore Institute of Technology

Course: BMAT205L - Discrete Mathematics and Graph Theory

Class NBR(s): 0865 / 0870 / 0890 / 0894 / 0895 / 2451 / 4396

Slot: A2+TA2+TAA2

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

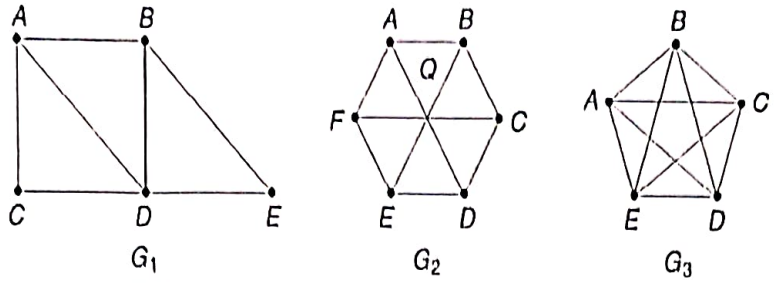
BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

Answer ALL Questions

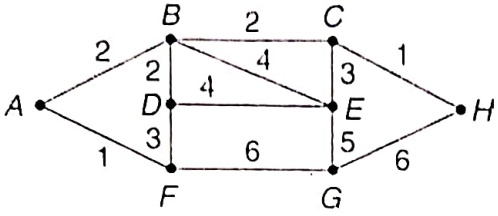
(10 X 10 = 100 Marks)

1.	With and without constructing the truth tables, find the principal disjunctive normal form of the following statement: $p \wedge \sim (q \wedge r) \vee (p \rightarrow q)$.	CO1	BL2
2.	Verify whether the following set of premises is inconsistent or not? If Parthi gets his degree, he will go for a job. If he goes for a job, he will get married soon. If he goes for higher study, he will not get married. Parthi gets his degree and goes for higher study.	CO1	BL3
3.	Check whether the set Q^+ of all positive rational numbers forms an abelian group under the binary operation $\otimes$ defined by $x \otimes y = \frac{xy}{2}; x, y \in Q^+$.	CO2	BL3
4.	State and prove Lagrange's theorem on group.	CO2	BL2
5.a)	(i) Find the number of integers between 1 and 250 both inclusive that are not divisible by any of the integers 2, 3, 5 and 7.	CO3	BL3
	(ii) A man hiked for 10 hours and covered a total distance of 45 km. It is known that he hiked 6 km in the first hour and only 3 km in the last hour. Show that he must have hiked at least 9 km within a certain period of 2 consecutive hours.		
	OR		
5.b)	Use the method of generating function to solve the recurrence relation $a_n = 4a_{n-1} - 4a_{n-2} + 4^n$; $n \geq 2$, given that $a_0 = 2$ and $a_1 = 8$.	CO3	BL3
6.	(i) If R is the relation on the set of integers such that $(a, b) \in R$ if and only if $b = a^m$ for some positive integer m, show that R is a partial ordering.	CO4	BL2
	(ii) If $\{L, \leq\}$ is a lattice, then for any $a, b, c \in L$, prove that $a \wedge (b \vee c) \geq (a \wedge b) \vee (a \wedge c)$.		
7.	Simplify the following expressions using Boolean algebra: (i) $a'b(a' + c) + ab'(b' + c)$ (ii) $a + a'bc' + (b + c)'$	CO4	BL3

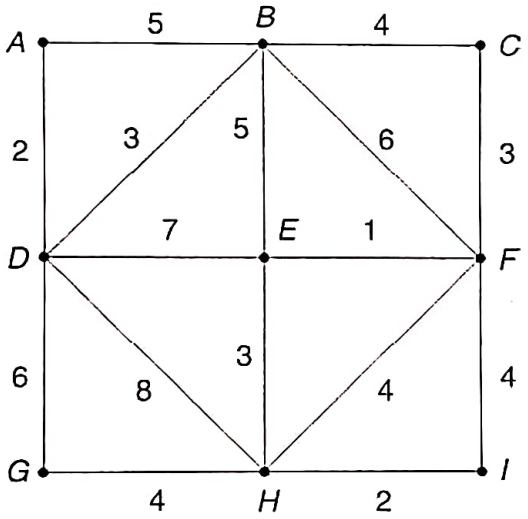
8. (i) Find a Euler path or a Euler circuit, if it exists, in each of the three graphs shown below. If it does not exist, explain why? **CO5 BL2**



(ii) Use Dijkstra's algorithm to find the shortest path between the vertices A and H in the given weighted graph.



9.a) Explain Kruskal's algorithm and Prim's algorithm and use them to find a minimum spanning tree for the given weighted graph. **CO5 BL3**



OR

9.b) (i) Prove that a tree with n vertices has (n – 1) edges. **CO5 BL3**

(ii) An undirected graph is a tree, if and only if, there is a unique simple path between every pair of vertices.

10. a) Define complete graph on n vertices and find the chromatic polynomial of it. **CO5 BL2**

b) Find the chromatic number of a path, cycle, and complete bipartite graphs.

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