

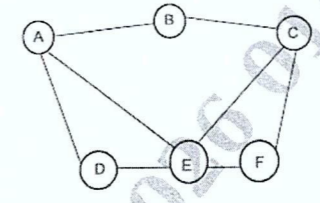
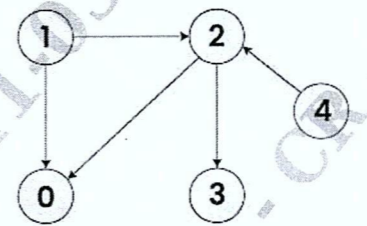
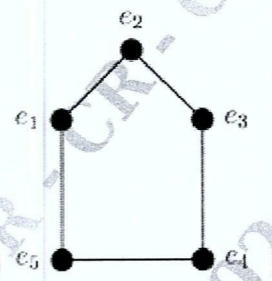
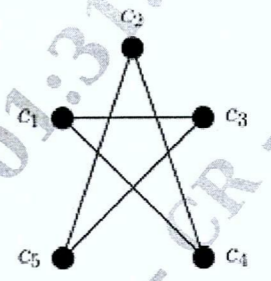
**First Semester MCA Degree Examination, Dec.2025/Jan.2026**  
**Discrete Mathematics and Graph Theory**

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.  
 2. M : Marks, L: Bloom's level, C: Course outcomes.*

Module - 1		M	L	C	
Q.1	a.	What is a set ? With an example explain the following set operations. i. union                      ii. intersection                      iii. compliment iv. relative compliment                      v. symmetric difference	10	L1	CO1
	b.	State and prove the following laws of set theory. i. Distributive laws    ii. DeMorgan's laws	10	L1	CO1
OR					
Q.2	a.	A survey of 500 television viewers of a sports channel produced the following information.: 285 watch cricket, 195 watch hockey, 115 watch football, 45 watch cricket and football, 70 watch cricket and hockey, 50 watch hockey and football and 50 do not watch any of the three kinds of the game. (i) How many viewers watch all the three kinds of the game? (ii) How many viewers watch exactly one of the sports?	10	L2	CO1
	b.	Define eigen value and eigen vector of matrix. Find the eigen value and eigen vector of $\begin{bmatrix} 1 & 4 \\ -4 & -7 \end{bmatrix}$	10	L2	CO1
Module - 2.					
Q.3	a.	Define tautology. Find whether the following compound propositions are tautologies or not. i. $((p \vee q) \wedge ((p \rightarrow r) \wedge (q \rightarrow r))) \rightarrow r$ ii. $((p \rightarrow q) \vee (p \rightarrow r)) \leftrightarrow (p \rightarrow (q \vee r))$	10	L2	CO2
	b.	For any propositions p, q and r prove the following.( $\equiv$ stands for logically equivalent propositions) i. $((p \rightarrow q) \wedge (p \rightarrow r)) \equiv (p \rightarrow (q \wedge r))$ ii. $((p \rightarrow q) \rightarrow r) \equiv ((p \wedge \neg r) \rightarrow \neg q)$	10	L2	CO2
OR					
Q.4	a.	Write the converse, inverse and contrapositive of the statement "If a quadrilateral is a parallelogram then its diagonal bisects each other".	06	L2	CO2
	b.	Write the negation of the statement "If it rains, then I do not drive the car".	06	L2	CO2
	c.	Verify whether 't' is a valid conclusion from the premises : $p \rightarrow q, q \rightarrow r, r \rightarrow s, \neg s$ and $p \vee t$ .	08	L2	CO2

Module - 3

Q.5	a.	With an example explain the following. i. regular graph    ii. complete graph    iii. Bipartite graph iv. walk in graph    v. paths in a graph	10	L2	CO3
	b.	What is handshaking property? Verify the handshaking property to the following graph.  <div style="text-align: center;">  <p>Fig. Q5b</p> </div>	05	L2	CO3
	c.	List the in-degree and out-degree of all the vertices of the following graph.  <div style="text-align: center;">  <p>Fig. Q5c</p> </div>	05	L2	CO3
OR					
Q.6	a.	What are isomorphic graphs?. Verify whether the following graphs are isomorphic or not.  <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <p style="text-align: center;">Fig. Q6a</p>	10	L3	CO3
	b.	With an example explain the following. i. subgraphs    ii. finite graph    iii. infinite graph iv. circuit    v. null graph	10	L2	CO3
Module - 4					
Q.7	a.	With an example explain the following. i. Eulerian circuit ii. Hamiltonian circuit	10	L3	CO4
	b.	With an example explain the following operations on graphs. i. union    ii. intersection.    iii. compliment    iv. ring sum	10	L2	CO4

