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Maximum Weight : 10

Section II

ME 010 105—MCQ—GRAPH THEORY

MCQ — GRAPH THEORY

[TO BE ATTACHED TO THE MAIN ANSWER-BOOK]

M.Sc. DEGREE (C.S.S.) PRIVATE EXAMINATION, MAY 2026

DO NOT WRITE YOUR REGISTER NUMBER OR NAME ANYWHERE IN SECTION II OF
THE QUESTION PAPER

Answer all questions.

All questions carry equal weight.

Put a tick mark [✓] against the correct answer.

1. A vertex of a graph is called even or odd depending upon :

- (A) Total number of edges in a graph is even or odd. ☐
- (B) Total number of vertices in a graph is even or odd. ☐
- (C) Its degree is even or odd. ☐
- (D) None of these. ☐

2. If the degree of vertex $d(v) = k$ for every vertex v of the graph G , then G is called :

- (A) K -regular graph. ☐ (B) K graph. ☐
- (C) Planar graph. ☐ (D) None of these. ☐

3. A spanning 1-regular subgraph of G is called :

- (A) Spanning tree. ☐ (B) Clique. ☐
- (C) Cubic graph. ☐ (D) 1-factor graph. ☐

4. A graph is r -regular if :

- (A) $\kappa(G) \geq r$. ☐ (B) $\kappa(G) < r$. ☐
- (C) $\kappa(G) = r$. ☐ (D) $\kappa(G) = 0$. ☐

Turn over





26151746

5. A maximal non-separable subgraph of a graph is :
- (A) Block. ☐ (B) Separable. ☐
(C) Non-separable. ☐ (D) None. ☐
6. The number of vertices of odd degree in a graph is always _____.
(A) Odd. ☐ (B) Even. ☐
(C) 1. ☐ (D) 0. ☐
7. The number of edges in a tree on n vertices is :
(A) n . ☐ (B) 1. ☐
(C) $n - 1$. ☐ (D) $n - 2$. ☐
8. Tracing all edges on a graph without picking up your pencil or repeating and starting and stopping at different vertices is called _____.
(A) Euler tour. ☐ (B) Euler trail. ☐
(C) Hamiltonian path. ☐ (D) Hamiltonian cycle. ☐
9. A given graph G is a Euler graph if and only if all vertices of G are of _____.
(A) Same degree. ☐ (B) Even degree. ☐
(C) Odd degree. ☐ (D) Different degree. ☐
10. For which of the following, Euler tour is never possible if number of vertices is greater 2 :
(A) K_n . ☐ (B) Q_n . ☐
(C) W_n . ☐ (D) C_n . ☐
11. Identify true statements :
- I. Every complete graph is Hamiltonian.
II. Every wheel graph is Hamiltonian.
III. Every complete bipartite graph is Hamiltonian.
- (A) I only. ☐
(B) I and II only. ☐
(C) I, II and III. ☐





26151746

12. The minimum number of colours needed for a proper vertex colouring of planar graph is _____.

(A) 2.

☐

(B) 3.

☐

(C) 4.

☐

(D) 5.

☐

13. What will be the chromatic number for a line graph having n vertices ?

(A) 0.

☐

(B) 1.

☐

(C) 2.

☐(D) n .☐

14. For any simple graph G with n vertices and chromatic number χ , then which if the following statements are true :

I. $2\sqrt{n} \leq \chi + \chi^c \leq n + 1$.

II. $n^2 \leq \chi\chi^c \leq \left(\frac{n+1}{2}\right)^2$.

III. $2n \leq \chi + \chi^c \leq \sqrt{n+1}$.

IV. $n \leq \chi\chi^c \leq \left(\frac{n+1}{2}\right)^2$.

(A) I and II.

☐

(B) I and IV.

☐

(C) II and III.

☐

(D) III and IV.

☐

15. A graph is called critical if for every proper subgraph H of G :

(A) $\chi(H) = \chi(G)$.

☐

(B) $\chi(H) \leq \chi(G)$.

☐

(C) $\chi(H) < \chi(G)$.

☐

(D) $\chi(H) \geq \chi(G)$.

☐

16. Which of the following is the correct statement of Brooks' theorem :

(A) If a connected graph G is neither an odd cycle nor a complete graph, then $\chi(G) \leq 1 + \Delta(G)$.☐(B) If a connected graph G is neither an odd cycle nor a complete graph, then $\chi(G) \leq \Delta(G)$.☐(C) If a connected graph G is neither an odd cycle nor a complete graph, then $\chi(G) \geq 1 + \Delta(G)$.☐(D) If a connected graph G is neither an odd cycle nor a complete graph, then $\chi(G) \geq \Delta(G)$.☐**Turn over**



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17. The number of edges of a connected plane graph with 8 vertices and 5 faces is :

(A) 5.

☐

(B) 11.

☐

(C) 15.

☐

(D) 13.

☐

18. The girth of a graph is :

(A) Length of a shortest path in G.

☐

(B) Length of a shortest cycle in G.

☐

(C) Number of faces of G.

☐

(D) Number of bounded faces of G.

☐

19. Which of the following statements about $K_{3,3}$ is not true ?

(A) Removal of a vertex results in a planar graph.

☐

(B) It is a nonplanar graph with the smallest number of vertices.

☐

(C) It is a nonplanar graph with the smallest number of edges.

☐

(D) Contraction of an edge results in a planar graph.

☐

20. The spectrum of the complete graph K_6 is :

(A) $\begin{pmatrix} 6 & -1 \\ 1 & 5 \end{pmatrix}$.☐(B) $\begin{pmatrix} 5 & -1 \\ 1 & 5 \end{pmatrix}$.☐(C) $\begin{pmatrix} 6 & 1 \\ 1 & 5 \end{pmatrix}$.☐(D) $\begin{pmatrix} 5 & 1 \\ 1 & 5 \end{pmatrix}$.☐

No. of MCQ's attempted

Weight Scored

(To be entered by the examiner)

No. of MCQ's not attempted

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THE MAIN ANSWER-BOOK**

