Roll.No. | 20UMACT5012

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.Sc Mathematics- END SEMESTER EXAMINATIONS - NOVEMBER 2025
SEMESTER - V
20UMACT5012 - Graph Theory

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. a) Define Graph with an example.
   b) Define Isomorphic and also prove that the number of odd degree vertices (that is vertices whose degrees are odd) in a graph G is even.
2. (a) Define Cut-vertex in a graph G.
   (b) If W is a walk connecting u and v in a graph G, then W contains a path connecting u and v.
3. If G is a Hamiltonian graph, then prove that $\omega(G-S) \leq |S|$, for every nonempty subset S of $V(G)$.
4. (a) Define acyclic graph.
   (b) Prove that the following statements are equivalent for a(p,q) graph G.
   (i) G is a tree.
   (ii) G is connected and q = p - 1.
   (iii)G is acyclic and q = p - 1.
5. Define and state the properties of Adjacency matrix and Incidence matrix of G.
6. (a) Define Planar graph with example.
   (b)Give reason, why a polyhedron is said to be a convex.
   (c)State and prove Wagner theorem.
7. Prove that if G is a bipartite graph with $q(G) \geq 1$, then $\chi(G) = \triangle(G)$.
8. If G is a graph on p vertices, then prove that $2\sqrt{p} \leq \chi(G) + \chi(\bar{G}) \leq p + 1$.

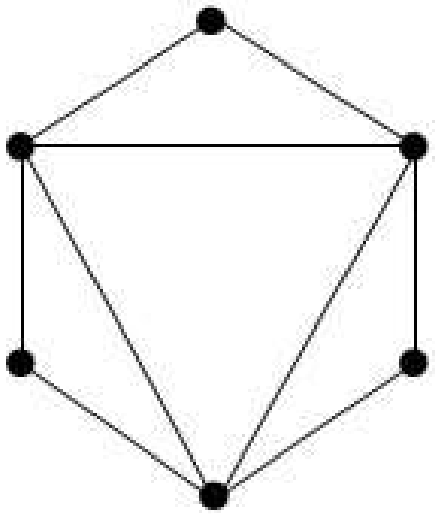
Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. a) Define Connected graph.
   b) If $q > (p^2/4)$, then prove that every (p,q)-graph contains a triangle.

Contd...

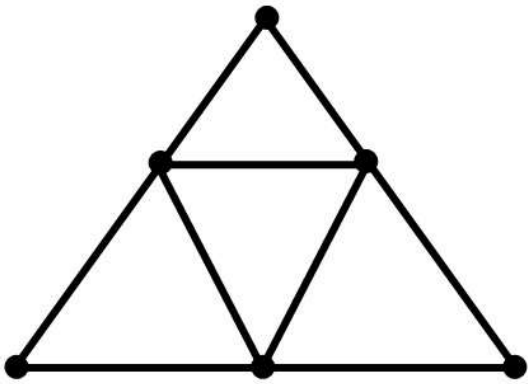
10. Find the closed Eulerian trails in the following graph.



11. State and prove Hall's theorem.

12. a) State and prove Euler formula for planar graphs.
    b) Show that a graph G is planar if G contains no subdivision of K_5 or $K_{3,3}$.

13. Colour the following graph using the sequential algorithm.



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