Avinashilingam Institute for Home Science and Higher Education for Women
Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD (now MoE)
Re-accredited with A++ Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

Continuous Internal Assessment Test II – April 2025
VI Semester

Class : III UG **Time : 2 Hours**
Branch : Mathematics **Max. Marks : 60**

21BMAC26 – Graph Theory

Course Outcomes:
CO1: Understand the basic definitions and properties of graphs.
CO2: Identify different kinds of special graphs.
CO3: Apply the concept of graph theory to relevant fields.
CO4: Develop mathematical models using graph theory.
CO5: Solve real world problems using graph theory.

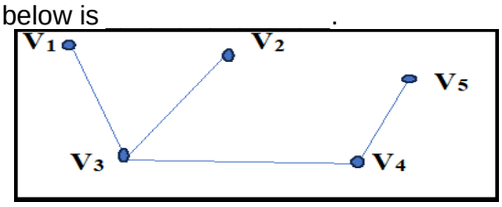
Part A **6 x 1 = 6**
Choose the Correct Answer

1.The length of Hamiltonian path in a connected graph of n vertices is _____ CO3K1
a. n-1 b. n c. 1 d. 0

2. A _____ graph cannot have a circuit. CO4K1
a. simple b. minimally connected c. connected d. complete

3. A vertex of degree one is called as a _____. CO4K2
a. cut vertex b. pedant vertex c. isolated vertex d. connectivity vertex

4. The center of the graph below is _____.



a. V_3, V_5 b. V_3, V_4 c. V_1, V_2 d. V_1, V_5 CO4K1

5. The spanning tree is also referred to as _____. CO5K2
a. Skeleton b. Scaffolding c. both a. & b. d. neither a. nor b.

6. The one connected graph is same as the ____. CO5K1
a. separable graph b. standard graph
c. edge connected graph d. vertex connected graph

Part B **3 x 6 = 18**
Answer ALL questions

7. a. Prove that in a complete graph with n vertices there are (n-1)/2 edge disjoint Hamiltonian circuit if n is an odd number n ≥ 3. CO3K3

(or)

7. b. Prove that a tree with n vertices has n-1 edges. CO4K3

8. a. A graph G with n vertices , n-1 edges and no circuit is connected. CO4K3

(or)

8. b. Prove that every tree has either one or more centres. CO4K2

9. a. Prove that a vertex V in a connected graph G is a cut vertex if and only if there exist two vertices x and y in G such that every path between x and y passes through V. CO5K3

(or)

9. b. Show that vertex connectivity of any graph G never exceed the edge connectivity. CO5K3

Part C **3 x 12 = 36**
Answer ALL questions

10. a. State and prove DIRAC's theorem. CO3K3

(or)

10. b. State and prove Ore theorem. CO4K3

11. a. (i) Prove that the distance between the vertices of a connected graph is a metric.
(ii) Show that every graph has one spanning tree. CO4K3

(or)

11. b. (i) Show that if the interaction of two paths is a disconnected graph, then the union of the two paths has at least one circuit.
(ii) Prove that with respect to any of its spanning trees, a connected graph of n vertices and e edges has n-1 tree branches and e-n+1 chords. CO4K3

12. a. (i) Prove that a ring sum of any two cut set in a graph is either a third cut set or an edge disjoint union of cut set .
(ii) Prove that on minimum vertex connectivity one can get the graph with G of n vertices and e edges (e ≥ n-1), if the integral part of the number is (2e)/n . CO5K3

(or)

12. b. Prove that with respect to a given spanning tree T, a branch b_i that determines a fundamental cut set S is contained in every fundamental circuit associated with the chords in S and is no other. CO5K3

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