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SARDAR PATEL UNIVERSITY
B.Sc. (SEM-VI) Examination(Regular & NC)
Wednesday, 6th April, 2016
US06CMTH05 : (Graph Theory)

Time: 02:30 a.m. to 05:30 p.m. **Maximum Marks : 70**

Note: Figures to the right indicate marks to the questions.

Q.1 Answer the following by selecting the correct choice from the given options. [10]

(1) Null graph has ________ edges.
(a) 1 (b) 2 (c) 0 (d) 3

(2) An Edge whose endpoints are the same vertex is called ______.
(a) trivial graph (b) multigraph (c) loop (d) multiple edges

(3) Degree of isolated vertex is_____
(a) 2 (b) 1 (c) 0 (d) 3

(4) A graph with each vertices has even degree is called ______
(a) unicursal graph (b) Euler graph (c) sub graph (d) Decomposition

(5) A connected graph having no circuit is called______
(a) simple graph (b) Euler graph (c) Tree (d) walk

(6) In decomposition of graph G for two sub graphs g_1 and g_2 , $g_1 \cap g_2$ = ______
(a) g_1 (b) g_2 (c) G (d) $\emptyset$

(7) Rank of a graph is given by r= ______
(a) n-k (b) n-r (c) e-(n-k) (d) r+e

(8) In a separable graph a vertex whose removal makes the graph disconnected is known as____
(a) cut node (b) edge connectivity (c) vertex connectivity (d) none

(9) In geometric dual of graph, the vertices are taken as _______
(a) edges (b) vertices (c) faces (d) none of these

(10) In a graph having 6 vertices and 5 regions, number of edges = _____.
(a) 3 (b) 5 (c) 7 (d) 9

Q.2 Answer ANY TEN of the following. **[20]**

(1) Define : (1) simple graph (2) isomorphic graph
(2) Define: degree of a vertex with an example.
(3) Define: closed walk with an example.
(4) Does Konigsberg bridge problem give Euler graph? why?
(5) Explain Hamiltonian path with an example.
(6) P.T. there is one and only one path between every pair of vertices in a tree.
(7) Define: spanning tree with an example.
(8) Define: K-connected graph with example.
(9) Define : edge connectivity and vertex connectivity .
(10) In usual notation Prove that $e \leq 3n - 6$.
(11) Define: 2-isomorphic graph.
(12) Using Euler theorem prove that Kurtosis's 2nd graph is non planer.

Q.3

(a) Prove that a simple graph with n vertices and k components can have at most $\frac{(n-k)(n-k+1)}{2}$ edges. [5]

(b) Prove that If a graph (connected or disconnected) has exactly two vertices of odd degree there must be a path joining these two vertices. [5]

OR

Q.3

(a) Prove that a graph G is disconnected iff its vertex set V can be partitioned into two nonempty disjoint subset V_1 and V_2 such that there exists no edge in G whose one end vertex is in subset V_1 and other in subset V_2. [5]

(b) Discuss: (1) Seating Arrangements problem (2) Utilities problem. [5]

Q.4

(a) Prove that in a complete graph with n vertices there are $\frac{(n-1)}{2}$ edge disjoint Hamiltonian circuits, if n is an odd number ≥ 3. [5]

(b) Prove that a graph is a tree iff it is minimally connected. [5]

OR

Q.4

(a) Prove that a connected graph G is an Euler graph iff it can be decomposed into circuits. [5]

(b) Prove that Every tree has either one or two centres. [5]

Q.5

(a) Prove that "with respect to a given spanning tree T, a branch b_i that determines fundamental cut-sets occurs in every fundamental circuits γ associated with the chords in cut-set S and in no other. [5]

(b) Define: Fundamental cut set. Also discuss the method to find Fundamental cut sets of graph [5]

OR

Q.5

(a) Prove that every circuit has an even number of edges in common with any cut set. [5]

(b) Prove that every connected graph has at least one spanning tree. [5]

Q.6 Prove that k_5 is non planer graph. [10]

OR

Q.6 State and prove Euler's theorem. [10]

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