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DG-3155

B. Sc. (Sem. V) Examination

March/April – 2016

MTH - 505 : Mathematics

(Graph Theory)

Time : Hours] [Total Marks : **50**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. Sc. (Sem. V)**

Name of the Subject :

☛ **MTH - 505 : MATHEMATICS**

☛ Subject Code No. : **3 1 5 5** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) All questions are compulsory.

(3) Follow usual notations.

(4) Figures to the right indicate marks of the question.

Que:1 Answer any **FIVE** as directed. **[10]**

(1) Find the degree of each vertex in null graph with 9 vertices.

(2) Draw complete simple graph having four vertices.

(3) Draw the graphs of the chemical compounds: CH_4 and N_2O_3.

(4) Prove that every self loop is a circuit but converse is not true.

(5) If G_1 and G_2 are edge disjoint graph then show that $G_1 \oplus G_2 = G_1 \cup G_2$.

(6) What is the maximum number of edges in a simple graph with 10 vertices and 3 components?

(7) Explain : Components of a graph.

(8) State two properties of binary trees.

Que:2 Attempt any **TWO.** **[10]**

(1) State and solve Utility problem of three houses and three utilities namely, water, gas and electricity.

(2) Define the following terms and give illustration for each of them:
(1) Adjacent edges (2) Edges in series (3) Incident vertices

(3) Show that in any finite graph with n vertices ,the sum of degrees of vertices is twice the number of edges in it.

(4) Prove that in a simple graph with n vertices, the maximum degree of any vertex is $(n-1)$ and the maximum number of edges is $\frac{n(n-1)}{2}$.

Que:3 Attempt any **TWO.** **[10]**

(1) If G is a connected graph with exactly 2k odd vertices ,then prove that there exist k edge disjoint subgraph such that they together contain all edges of G and that each is a unicursal graph.

(2) Explain the following terms and give one illustration of it:
(i) Deletion of an edge (ii) Fusion of two vertices

(3) Explain : Isomorphism of two graphs, included its necessary conditions.

(4) In a graph G ,if P_1 *and* P_2 be two different paths between two vertices ,then prove that $P_1 \oplus P_2$ is a circuit or a set of circuit in G .

Que:4 Attempt any **TWO.** **[10]**

(1) Prove that a graph G is disconnected if and omly if its vertex set V can be partitioned intotwo non empty disjoint subsets $V_1$and V_2 in which there is no edge in G whose one end vertex in V_1 and other in V_2.

(2) Define Hamiltonian path. Can a Hamiltonian circuit be constructed in a complete graph ? Justify.

(3) Prove that a graph containing m edges namely, $e_1, e_2,\ldots,e_m$, can be decomposed in $(2^{m-1}-1)$ different ways into pairs of sub graphs g_1 and g_2.

(4) A connected graph G with n vertices becomes disconnected if any of its edge is removed from it, then prove that (i) G is a simple and (ii) G has exactly (n-1) edges.

Que:5 Attempt any **TWO.** **[10]**

(1) If G is a connected graph with n vertices and (n-1) edges ,then prove that G is a tree.

(2) Let T be a tree with at least two vertices then prove that it has at least two pendent vertices.

(3) Define minimally connected graph .Prove that a graph is a tree if and only if it is minimally connected.

(4) Show that a graph G with n vertices , (n-1) edges and no circuit is connected.
