Nov - 2016
MTH - 15

B) Discrete Mathematics (111104)

. Time : Two Hours **Max. Marks : 60**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Graph or diagram should be drawn with the black ink pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory.
5. Figures to right indicates full marks.

1. a) Attempt **any six** of the following. 6

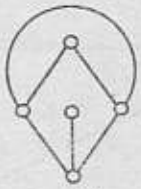
i) Degree of Pendant Vertex is -----
   a) zero b) one
   c) two d) three

ii) Total number of edges in graph $K_{5,7}$ is ----
   a) $5+7$ b) $7-5$
   c) 7×5 d) none of these

iii) A graph $K_{m,n}$ is Eulerian if and only if -----
   a) m even, n odd b) m odd, n even
   c) m, n are both odd d) m, n are both even

iv) If G is a graph with p vertices, q edges and k - components then
   a) $q \geq n+k$ b) $q \leq n+k$
   c) $q \geq n-k$ d) $q \leq n-k$

v) If G is planar graph with 7 vertices and 7 edges then number of faces in G is -------
   a) 7 b) 0
   c) 14 d) 2

vi) Chromatic number of graph  is - - - -
   a) 5 b) 6
   c) 3 d) None of these

vii) For any graph G with p vertices and q edges, rank of G is -----
   a) p + 1 b) p - 1
   c) q - p + 1 d) q + p - 1

viii) If complete graph K_n is tree then n = ?

a) 1 b) 3
c) 5 d) 7

b) Attempt **any six** of the following. 6

i) Define regular graph.

ii) Define even vertex.

iii) Define trail in graph.

iv) Define an edge connectivity of connected graph G.

v) Draw Kuratowski's second graph.

vi) Define balanced diagraph.

vii) Define a binary tree.

viii) Define radius and diameter of tree.

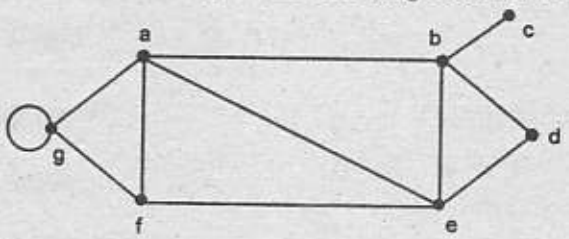
2. Attempt **any six** of the following. 12

i) Draw the graph G = (V(G), E(G))
where V(G) = { a, b, c, d, e, f } E(G) = { (a, d), (a, f), (b, c), (a, b)}

ii) State properties of isomorphism of graphs G_1 and G_2.

iii) Define self complementary graph.

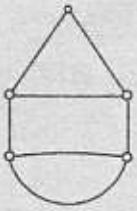
iv) State and verify Handshaking lemma for following graph.



v) Draw a graph with 6 vertices, 2 vertices of degree 4 and 4 vertices of degree 2.

vi) Find the number of edges in a simple graph with 16 vertices and 20 faces.

vii) Find the geometrical dual of the following graph.



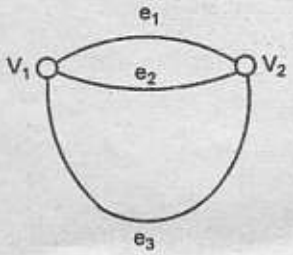
viii) Is tree with 9 vertices and 9 edges exists? Justify.

ix) Define rooted and binary trees.

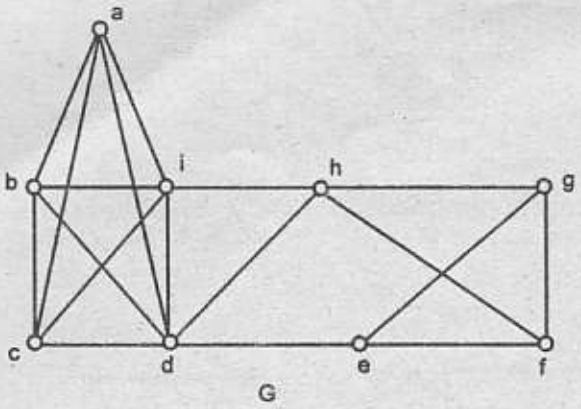
3. Attempt **any four** of the following. 12

i) Prove that the maximum number of edges in simple graph on 'n' vertices is $\frac{n(n-1)}{2}$

ii) Find six subgraphs of the following graph.



iii) In the following graph G find



a) path of length 4
b) cycle of length 8
c) d (a, f) and d (a, h)

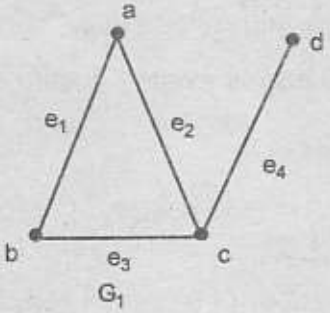
iv) Construct a graph in which $k(G)=2, \lambda(G)=3, \delta(G)=4$.

v) Show that k_5 is not planar graph.

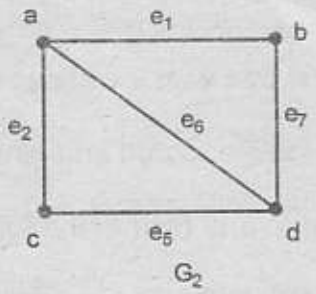
vi) Draw all non isomorphic trees on 6 vertices.

4. Attempt **any three** of the following. 12

i) Find $G_1 \cap G_2$, $G_1 \cup G_2$ and $G_1 \oplus G_2$, where G_1 and G_2 graphs are given below.



G_1



G_2

ii) Is it possible to construct a graph with 12 vertices such that 2 of the vertices have degree 3 and remaining vertices have degree 4? Justify.

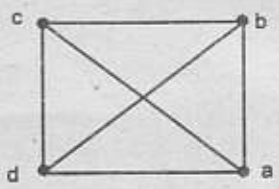
iii) Write short note on "Travelling Salesman problem".

iv) State and prove that Euler's formula for planar graph.

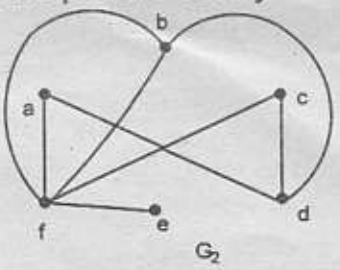
v) Find all rooted trees with four vertices.

5. Attempt **any two** of the following. 12

i) Are the following graphs are planar? Justify.

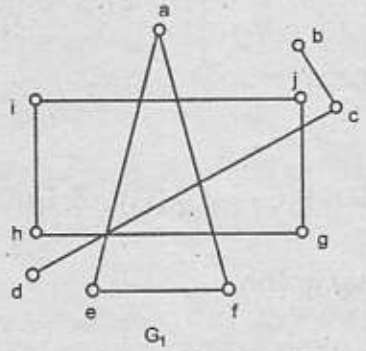


G_1

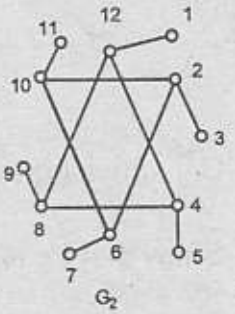


G_2

ii) Are the following graphs connected? Justify. Also find components of the each graph.



G_1



G_2

iii) Prove that a tree with n vertices must have (n - 1) edges.

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