



RAN-1044

B.Sc. Sem. V Examination

March / April - 2019

MH - 505 - Mathematics

(Graph Theory)

(Old or New to be mentioned where necessary)

[Total Marks: 50

સૂચના : / Instructions

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

Name of the Examination:

B.Sc. Sem. V

Name of the Subject :

MH - 505 - Mathematics

Subject Code No.:

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Seat No.:

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Student's Signature

- (1) All questions are compulsory.
- (2) Follow usual notations.
- (3) Figures to the right indicate marks of the question.

Que:1 Answer any FIVE as directed.

[10]

- (1) Draw the graphs of the chemical compounds: C_2H_4 and N_2O_3 .
- (2) What do you mean by isolated vertex and pendant vertex?
- (3) In a graph G , if there is one and only one path between every pair of vertices, then prove that G is a tree.
- (4) If G_1 and G_2 are vertex disjoint subgraphs, then what is $G_1 \oplus G_2$? Justify.
- (5) Show that the number of pendent vertices in a binary tree is $(n + 1)/2$.
- (6) If G is a simple graph with 15 vertices, then find the maximum number of edges in G , also write the maximum possible degree of a vertex of G .

- (7) Let G be a graph with n vertices and e edges. If two vertices v_1 and v_2 of G are fused and replaced by a single vertex v then what is the number of vertices and number of edges in G after fusion?
- (8) Construct a regular graph of six vertices and a complete graph of five vertices.

Que:2 Attempt any TWO. [10]

- (1) Define *finite graph*. Show that the sum of the degrees of all vertices in any finite graph G is twice the number of edges in G .
- (2) Explain seating arrangement problem for eleven persons.
- (3) Explain the following terms using illustration:
Adjacent vertices and Adjacent edges, Parallel edges, Edges in series.

Que:3 Attempt any TWO. [10]

- (1) Explain *isomorphism* of two graphs using illustration.
- (2) Explain *union of graphs, intersection of graphs and ring sum of graphs* using illustration.
- (3) Prove that a graph containing m edges can be decomposed in 2^{m-1} different ways into pair of subgraphs, g_1 and g_2 .

Que:4 Attempt any TWO. [10]

- (1) Show that a simple graph with n vertices and k components can have at the most $\frac{(n-k)(n-k+1)}{2}$ edges.
- (2) Prove that a given connected graph G is an Euler graph if and only if all vertices of G are of even degree.
- (3) Define a *complete graph*. Prove that a Hamiltonian circuit can be constructed in a complete graph.

Que:5 Attempt any TWO. [10]

- (1) Show that a tree with n vertices has $n - 1$ edges.
- (2) Show that the distance between vertices of a connected graph is a metric.
- (3) Define *center, radius and diameter of a tree*. Using example, show that the radius of a tree need not be half its diameter.
