AS-1506

B.C.A. (Part–I) Semester—II Examination

DISCRETE MATHEMATICS

Paper–2 ST 5

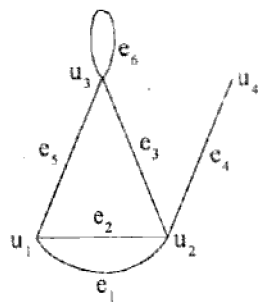
Time : Three Hours] [Maximum Marks : 60

Note :— (1) All questions carry equal marks.

(2) Attempt **one** question from each Unit.

UNIT–I

1. (a) Define Graph. Find from the following graph :



(i) Degree of each vertex.

(ii) Pendent vertex.

(iii) Isolated vertex.

(iv) On which vertex loop is present ? 6

(b) Define :

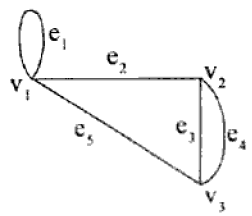
(i) Bipartite graph.

(ii) Null graph.

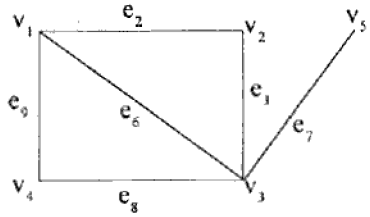
(iii) Finite graph. 6

OR

2. (p) Find $G_1 \cup G_2$, $G_1 \cap G_2$ and $G_1 \oplus G_2$ of graphs G_1 and G_2. 6



G_1



G_2

(q) Show that the maximum degree of any vertex in a simple graph with n vertices is (n – 1). 6

UNIT–II

3. (a) Define :

(i) Walk (ii) Path

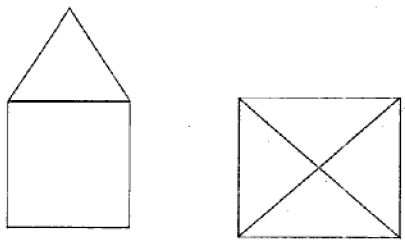
(iii) Trail (iv) Tour

(v) Cycle (vi) Distance between two vertices 6

(b) Show that the vertex connectivity of a graph G can not exceed the edge connectivity of G i.e. $k(G) \leq \lambda(G)$. 6

OR

4. (p) Define edge connectivity and vertex connectivity of a graph. Also find edge connectivity and vertex connectivity of following graph. 6

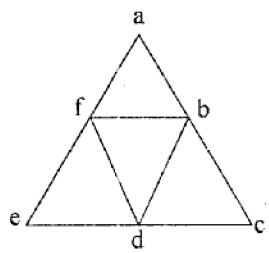


(q) Define isthmus and prove that an edge e of a graph G is isthmus iff it does not belong to any circuit. 6

UNIT–III

5. (a) Prove that a graph is Eulerian if and only if it is decomposed into circuits. 6

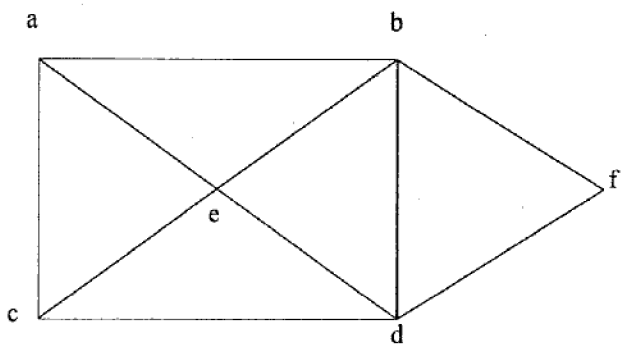
(b) Show that the following graph is Eulerian and find an Eulerian circuit in G. 6



OR

6. (p) Prove that a graph is Eulerian if and only if degree of each vertex is even. 6

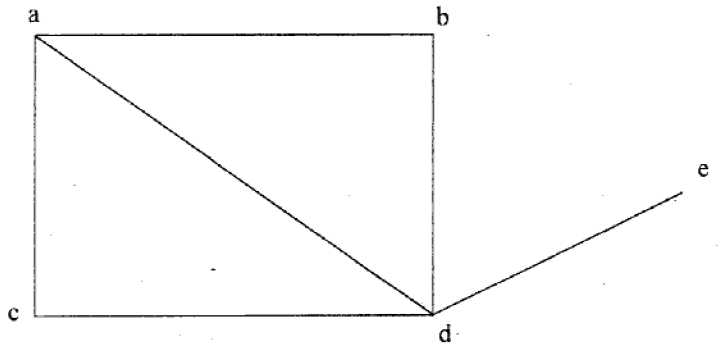
(q) Define Hamiltonian graph and trace the Hamiltonian circuit in the following graph. 6



UNIT–IV

7. (a) Define centre, radius and eccentricity of a tree with example. 6

(b) Find all the spanning trees of the following graph. 6



OR

8. (p) Prove that a graph with n vertices is a tree if and only if it is circuit free and has (n – 1) edges. 6

(q) Prove that binary tree has odd number of vertices. 6

UNIT–V

9. (a) Define Shortest Spanning Tree. Write the Kruskal's algorithm to find the shortest spanning tree. 6

(b) Draw the arborescence corresponding to each of the following expressions and write it in Polish notation :

(i) $a + b - c. d \div (g^x - f)$

(ii) $(3x + y)(6a - 3b)^4$. 6

OR

10. (p) Draw the figure of a directed graph given formally as :

$V(G) = \{A, B, C, D\}$

$E(G) = \{(A, D), (B, A), (B, A), (D, B), (B, C), (D, C), (B, B)\}$

Find indegree and outdegree of each vertex. 6

(q) Define :

(i) Diagraph

(ii) Network

(iii) Arborescence. 6