B. Sc. (I.T.) (Sem. II) Examination
March / April - 2016
Paper-202 : Mathematics - II

Time : 3 Hours] [Total Marks : 70

Instructions : (1)

(2) There are five questions in this question paper.
(3) Answer all questions.
(4) Figure to the right indicates marks of the questions.

1 Define any SEVEN. [14]

1. Path
2. Pendent vertex
3. Region
4. Disconnected graph
5. Ring-sum of graphs
6. Parallel edges
7. Rooted tree
8. Close walk
9. Path
10. Vertex connectivity

2(a) Discuss seating Problem. [5]

OR

(a) Prove that the number of odd vertices in a graph is always even.

(b) Attempt any THREE. [9]

1. Discuss the Utilities Problem.
2. Prove that an infinite graph with finite number of edges must have infinite number of isolated vertices.
3. Prove that every self-loop is a circuit but converse is not true.
4. Using an example prove that $G_1 \cup G_2 = G_2 \cup G_1$.

DDD-1717] 1 [Contd...
3(a) For a graph with $n$-vertices and $m$ edges, if $\delta$ is the minimum and $\Delta$ is the maximum of the degrees of vertices, show that $\delta \leq 2m/n \leq \Delta$

OR

(a) Prove that any connected graph with $n$ vertices and $n - 1$ edges is a tree.

(b) Attempt any THREE.
1. Prove that a tree with more than two vertices will always have at least two pendant vertices.
2. Prove that a simple graph with $n$ vertices must be connected if it has more than $\frac{(n-1)(n-2)}{2}$ edges.
3. Prove that if a tree has two centers then those two centers must be adjacent.
4. A graph $G$ is disconnected if and only if its vertex set $V$ can be partitioned into two non-empty, disjoint subset $V_1$ and $V_2$ such that there exist no edge in $G$ whose one end vertex is in subset $V_1$ and other is in subset $V_2$.

4(a) Prove that $K_{3,3}$ is non-planar

OR

(a) Define planer graph and prove that complete graph of five vertices is non-planer.

(b) Attempt any Two.

1. Discuss BFS algorithm to find minimum spanning tree.
2. Prove that a branch $b_i$, that determines a fundamental cut-set $S_i$, is contained in every fundamental circuit associated with the chords of $S$ and in no other.
3. Prove that the maximum no of edges in a simple graph with $n$ vertices is $n(n-1)/2$.

(c) If a graph has exactly two vertices of odd degree then prove that there must be a path joining these two vertices.

5(a) Define a minimal spanning tree and discuss Prime’s algorithm to find minimum spanning tree.

OR

(a) Discuss the observation about the adjacency matrix.
(b) Attempt any THREE.
1. In a simple connected planar graph with \( f \) regions, \( n \) vertices and \( e \) edges \((e > 2)\). Show that (1) \( e \geq \frac{3f}{2} \) and (2) \( e \leq 3n - 6 \).
2. 1. Define path matrix and make a path matrix between \( v4 \) and \( v5 \) of the following graph.

3. Discuss the observation about the path matrix.
(c) Define Rank and Nullity of a graph.