**Question Bank**

**Unit -5**

**Discrete Mathematics**

Course Code: MATH 2007

| Sl No. | Questions | CO | Bloom’s Taxonomy Level | Difficulty Level | Competitive Exam Question Y/N | Area | Topic | Unit | Marks |
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| 1 | How many vertices and how many edges do  graphs have? | 5 | K1 | L | N |  | Basic Terminology of Graphs | 5 | 2 |
| 2 | How many sub graphs with at least one vertex does have? | 5 | K2 | M | N |  | Basic Terminology of Graphs | 5 | 2 |
| 3 | For which values of and  is  is regular? | 5 | K1 | M | N |  | Basic Terminology of Graphs | 5 | 2 |
| 4 | Is every zero-one square matrix that is symmetric and has zeros on the diagonal the adjacency matrix of a simple graph? | 5 | K1 | L | N |  | Basic Terminology of Graphs | 5 | 2 |
| 5 | What is the sum of the entries in a column of the adjacency matrix for an undirected graph? For a directed graph? | 5 | K2 | M | N |  | Basic Terminology of Graphs | 5 | 2 |
| 6 | How many edges does a graph have if its degree sequence is 4, 3,3,2,2? Draw such a graph? | 5 | K2 | M | N |  | Basic Terminology of Graphs | 5 | 6 |
| 7 | Show that the graphs and  displayed in the following figure are isomorphic. | 5 | K3 | M | N |  | **Isomorphism & Homeomorphism of graphs** | 5 | 6 |
| 8 | Show that if G and H are isomorphic directed graphs, then the converses of G and H are also isomorphic. | 5 | K3 | H | N |  | Isomorphism & Homeomorphism of graphs | 5 | 6 |
| 9 | Show that isomorphism of simple graphs is an equivalence relation. | 5 | K1 | H | N |  | Isomorphism & Homeomorphism of graphs | 5 | 9 |
| 10 | Which of the undirected graph in the following figure have an Euler circuit? Of those that do not, which have an Euler Path? | 5 | K2 | M | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 6 |
| 11 | Show that a connected multigraph with at least two vertices has an Euler circuit iff each of its vertices has an even degree. | 5 | K3 | H | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 9 |
| 12 | Which graphs shown in the following figure have an Euler path? Explain it. | 5 | K3 | M | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 6 |
| 13 | Which of the simple graphs in the following Figure have a Hamilton circuit or, if not, a Hamilton path? | 5 | K2 | M | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 6 |
| 14 | Show that  has a Hamilton circuit whenever | 5 | K3 | H | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 6 |
| 15 | Show that a directed multigraph having no isolated vertices has an Euler circuit if and only if the graph is weakly connected and the in-degree and out-degree of each vertex are equal. | 5 | K3 | H | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 9 |
| 16 | Derive an algorithm for constructing Euler circuits in directed graph. | 5 | K3 | H | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 9 |
| 17 | Derive an algorithm for constructing Euler paths in directed graph. | 5 | K3 | H | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 9 |
| 18 | Suppose that a connected planar simple graph has 20 vertices, each of degree 3. In to how many regions does a representation of this planar graph split the plane? | 5 | K3 | H | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 6 |
| 19 | State and prove Euler’s formula. | 5 | K3 | M | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 9 |
| 20 | What are the chromatic numbers of the graphs G and H shown in the following Figure? | 5 | K1 | M | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 2 |
| 21 | What is the chromatic number of ? | 5 | K2 | L | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 2 |
| 22 | Discuss the applications of Graph Colorings. | 5 | K3 | H | N |  | Euler and Hamiltonian paths, Graph coloring | 5 | 6 |
| 23 | Which of the graphs shown in the following Figure are trees? | 5 | K1 | L | N |  | Tree | 5 | 2 |
| 24 | Show that a tree with n vertices has n-1 edges. | 5 | K2 | H | N |  | Tree | 5 | 6 |
| 25 | Prove that a fully ary tree with  internal vertices contains  vertices. | 5 | K3 | H | N |  | Tree | 5 | 6 |
| 26 | Find the level of each vertex in the rooted tree shown in the following Figure. What is the height of this tree? | 5 | K1 | M | N |  | Tree | 5 | 2 |
| 27 | Form a build binary search tree for the words *mathematics, physics, geography, zoology, meteorology, geology, psychology, and chemistry* (using alphabetical order). | 5 | K2 | H | N |  | Tree | 5 | 2 |
| 28 | Build a binary search tree for the words *banana, peach, apple, pear, coconut, mango, and papaya* using alphabetical order. | 5 | K2 | M | N |  | Tree | 5 | 2 |
| 29 | In which order does a preorder traversal visit the vertices in the ordered rooted tree T as shown the following Figure. | 5 | K3 | L | N |  | Tree | 5 | 2 |
| 30 | In which order does an in order traversal visit the vertices in the ordered rooted tree T as shown the following Figure. | 5 | K3 | M | N |  | Tree | 5 | 2 |
| 31 | In which order does a post order traversal visit the vertices in the ordered rooted tree T as shown the following Figure. | 5 | K3 | H | N |  | Tree | 5 | 2 |
| 32 | What is the ordered rooted tree that represents the expression ? | 5 | K3 | L | N |  | Tree | 5 | 6 |
| 33 | Show that a simple graph is connected if and only if it has a spanning tree. | 5 | K3 | H | N |  | Tree | 5 | 6 |
| 34 | Find the binary tree corresponding to the given inorder and postorder traversals:  Postorder: 4,5,3,6,2,8,9,7,1  Inorder: 4,3,5,2,6,1,8,7,9 | 5 | K3 | M | N |  | Tree | 5 | 6 |
| 35 | Prove that an undirected graph is a tree if and only if there is a unique simple path between every pair of vertices. | 5 | K3 | H | N |  | Tree | 5 | 9 |
| 36 | Prove that the number of vertices in a full binary tree is always odd. | 5 | K1 | H | N |  | Tree | 5 | 9 |
| 37 | Show that in a binary tree with n vertices ,the number of pendant vertices are (n+1)/2. | 5 | K1 | M | N |  | Tree | 5 | 9 |
| 38 | Prove that ,if a connected planar graph of n vertices , m edges has f regions or faces, then n-m+f=2 | 5 | K2 | H | N |  | Tree | 5 | 6 |
| 39 | State Handshaking Lemma. | 5 | K3 | H | N |  | Tree | 5 | 9 |
| 40 | Show that it is possible to draw a tree with 10 vertices which has vertices either of degree 1 or degree 3. Is it possible to draw the same type of tree with 11 vertices? | 5 | K2 | H | N |  | Tree | 5 | 6 |
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Signature of Course Coordinator/DC:

Signature of Dean:

IQAC: