

U.G. 4th Semester Examination - 2022**MATHEMATICS****[PROGRAM]****Course Code : BMTMSERT404****Course Title : Graph Theory**

Full Marks : 50

Time : 2 Hours

*The figures in the right-hand margin indicate marks.**Notations and Symbols have their usual meanings.*

Answer **all** the following questions by choosing the correct alternative out of four options: $2 \times 25 = 50$

1. The graph is a collection of _____.
 - a) Row and columns
 - b) Equations
 - c) Vertices and edges
 - d) None of these
2. The maximum degree of any vertex in a simple graph with n vertices is
 - a) $n-1$
 - b) $n+1$
 - c) $2n-1$
 - d) n

3. Every Isomorphic graph must have a _____ representation.
 - a) Cyclic
 - b) Adjacency list
 - c) Tree
 - d) Adjacency matrix
4. A given connected graph G is a Euler graph if and only if all vertices of G are of
 - a) Same degree
 - b) Even degree
 - c) Odd degree
 - d) Different degree
5. The travelling salesman problem can be solved by using
 - a) A spanning tree
 - b) A minimum spanning tree
 - c) Bellman-Ford algorithm
 - d) DFS traversal
6. What is the order of the adjacency matrix corresponding to a graph with ' n ' nodes and ' m ' edges?
 - a) $n \times m$
 - b) $n \times n$
 - c) $m \times n$
 - d) $n \times 2n$

7. What is the maximum number of possible non-zero values in an adjacency matrix of a simple graph with n vertices?

a) $\frac{n(n-1)}{2}$

b) $\frac{n(n+1)}{2}$

c) $n(n-1)$

d) $n(n+1)$

8. What are the dimensions of an incidence matrix?

a) Number of edges $\times$ number of edges

b) Number of edges $\times$ number of vertices

c) Number of vertices $\times$ number of vertices

d) Number of edges $\times$ ($\frac{1}{2} \times$ number of vertices)

9. A graph with no edges is known as empty graph. Empty graph is also known as _____.

a) Trivial graph

b) Regular graph

c) Complete graph

d) None of these

10. Two graphs are said to be isomorphic if they have

a) Equal number of vertices

b) Equal number of edges

c) Same degree sequence

d) All of the above

11. In any undirected graph the sum of degrees of all the nodes

a) Must be even

b) Are twice the number of edges

c) Must be odd

d) Need not be even

12. The length of Hamiltonian path in a connected graph of n vertices is

a) $(n-1)$

b) n

c) $(n+1)$

d) $\frac{n}{2}$

13. Total number of simple graphs that can be drawn using six vertices are

a) 2^{15}

b) 2^{14}

c) 2^{13}

d) 2^{12}

14. Which of the following statements is true?
- Every graph is not its own sub graph.
 - The terminal vertex of a graph are of degree two.
 - A tree with n vertices has n edges.
 - A single vertex in graph G is a sub graph of G .
15. Consider a simple graph with 10 vertices. The graph will be a connected graph if it has at least _____ edges.
- 9
 - 8
 - 7
 - 6
16. A n -vertex graph has _____ edges.
- n^2
 - $(n-1)$
 - $\frac{n(n+1)}{2}$
 - $\frac{n(n-1)}{2}$

17. The tree elements are called _____.
- vertices
 - nodes
 - points
 - edges
18. Statement A: Incidence matrix and adjacency matrix of a graph will have same dimensions.
Statement B: Incidence matrix and adjacency matrix of a graph will have different dimensions.
- Statement A is false but B is true
 - Statement A is true but B is false
 - Both the statements are true
 - Can't say anything
19. A minimal spanning tree of a graph G is
- A spanning sub graph
 - A tree
 - Minimum weights
 - All of the above
20. How many non-isomorphic graph are possible with 6 vertices and 6 edges and degree of each vertex is 2?
- 2
 - 3
 - 4
 - 5

21. The column sum in an incidence matrix for a simple graph is _____.

- a) Depends on number of edges
- b) Always greater than 2
- c) Equal to 2
- d) Equal to the number of edges

22. A graph is tree if and only if

- a) Is planar
- b) Is minimally
- c) Contains a circuit
- d) Is completely connected

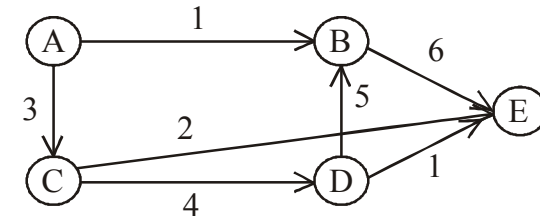
23. The complete graph with four vertices has K edges where K is

- a) 3
- b) 4
- c) 5
- d) 6

24. Graph consists of a

- a) Non-empty set of vertices
- b) Empty set of vertices
- c) Both (a) and (b)
- d) None of the above

25. In the given graph, identify the shortest path having minimum cost to reach vertex E if A is the source vertex:



- a) $A \rightarrow B \rightarrow E$
- b) $A \rightarrow C \rightarrow E$
- c) $A \rightarrow C \rightarrow D \rightarrow E$
- d) $A \rightarrow C \rightarrow D \rightarrow B \rightarrow E$
