

# **Yashwantrao Chavan College of Science, Karad**

## **Department of Computer Science Question Bank, 2023-2024 Subject: Mathematics (Graph Theory) Class: B.Sc. CS. (Entire)-I**

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- 1) State and prove Handshaking lemma.
- 2) Prove that : A tree with  $n$ - vertices has  $n-1$  edges
- 3) If  $K_n$  is complete graph on  $n$ -vertices then prove that
  - a) The degree of each vertex in  $K_n$  is  $n-1$
  - b) The number of edges in  $K_n$  is  $\frac{n(n-1)}{2}$
- 4) Define: (a) Parallel edges (b) Simple graph
- 5) How many edges are there in a graph with 10 vertices each of degree 6.
- 6) Define: (a) Regular graph (b) Bipartite graph
- 7) Can a simple graph with 7 vertices each of degree 3 exist ? Justify ?
- 8) Let  $G$  be a simple graph , Show that if  $G$  is not connected then its complement  $\overline{G}$  is connected.
- 9) If  $G$  is self complementary graph on  $n$ -vertices , then  $n$  is of the type  $4k$  or  $4k+1$ , for some integer  $k$
- 10) Define : (I) Vertex connectivity  
(II) Edge connectivity
- 11) Define : (I) Union of two graphs  
(II) Intersection of two graphs
- 12) Explain complement of a graph
- 13) Prove that : A connected graph  $G$  with  $n$  vertices &  $n-1$  edges is a tree
- 14) Define : (I) connected graph  
(II) disconnected graph
- 15) Explain Kruskal's algorithm



- 16) Prove that : A graph with  $n$  vertices is a tree if and only if it is a circuit free and has  $n-1$  edges
- 17) Explain spanning tree with example
- 18) Define : (I) walk  
(II) trail
- 19) Prove that : A graph  $G$  is a tree if and only if it is minimally connected
- 20) Explain any two types of graphs
- 21) Define : (I) tour  
(II) path
- 22) Explain isomorphism of graphs
- 23) Verify that A tree with  $n$ - vertices has  $n-1$  edges
- 24) Define Adjacency matrix with example
- 25) Define : (I) fundamental circuit  
(II) cut – set
- 26) Explain Dijkstra's shortest path algorithm
- 27) Verify that A connected graph  $G$  with  $n$  vertices &  $n-1$  edges is a tree
- 28) Explain incidence matrix with example
- 29) State & explain matrix representation of graphs
- 30) Define & give example of following graphs  
(I) induced graph  
(II) subgraph
- 31) Does there exist a party of 5 persons such that each one has exactly 3 friends in themselves? Justify.
- 32) Find the number of edges in  $K_{m,n}$ .
- 33) Determine minimum number of vertices in a simple graph with 30 edges.



34) Draw the graphs:

(i) Complete bipartite graph on 6 vertices

(ii) Regular graph with degree 4.

35) Define : (i) Path graph

(ii) Wheel

36) Give an example of self-complementary graph on 4-vertices & on 5-vertices.

37) Draw the graph: 3-regular graph with 6-vertices.

38) Does there exist a party of 11 professors such that each one has exactly 7 friends  
In themselves?

39) Define: (i) Isthmus

(ii) cut vertex

40) Explain any two types of graphs.