



Name: ..... Roll No.: .....

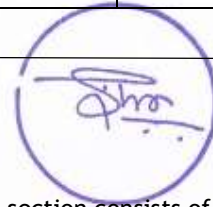
Branch: ..... Signature of Invigilator: .....

Semester: VIth Date: 26/04/2022 (MORNING)

Subject with Code: CS307 GRAPH THEORY

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE



1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.
2. The booklet will be distributed to the candidates before 05 minutes of the examination. Candidates should write their roll no. in each page of the booklet.
3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.
4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.
5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.
6. Write on both side of the leaf and use pens with same ink.
7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.
8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.
9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.
10. Always maintain the highest level of integrity. Remember you are a BITian.
11. Candidates need to submit the question paper cum answer sheets before leaving the examination hall.

CLASS – BE SEMESTER - VI  
BRANCH – CS  
SUBJECT – CS307 GRAPH THEORY  
TIME – 2 HRS

SESSION – SP -2022

FULL MARKS - 50

**Instructions:**

1. There are total 30 MCQs (each carrying 1 mark) and 10 short type questions (each carrying 2 marks).
2. All the questions are compulsory.
3. Put a tick ( $\checkmark$ ) for the correct choice.

**SECTION -A**

1. What is the degree of isolated vertex in graph?  
A) Degree is one  
B) Degree is Two  
C) Degree is Zero  
D) None of these
2. Which of the following is complete graph?  
A)  $K_5$   
B)  $K_{2,3}$   
C) Petersen Graph  
D) None of these
3. Which of the following is Hamiltonian graph?  
A) Petersen graph  
B) Any complete graph  
C) Butterfly graph  
D) All of above
4. Which of the following graph is Euler graph?  
A) Petersen graph  
B) Complete graph  $K_5$   
C) Petersen Graph  $K_4$   
D) None of these
5. What is circuit rank of  $K_4$ ?  
A) 4  
B) 3  
C) 5  
D) 8
6. How many edges in complete bipartite graph  $K_{3,5}$ ?  
A) 16  
B) 15  
C) 8  
D) None of these
7. A graph is called Euler Graph if  
A) Degree of all vertices of graph is even  
B) Degree of all vertices of graph is odd  
C) Both A & B  
D) None of these
8. Two isomorphic graph must have  
A) Equal number of vertices  
B) same number of edges  
C) Both A & B  
D) None of these
9. In any undirected graph , the sum of degrees of all the nodes  
A) must be even  
B) are twice the number of edges  
C) Both (A) and (B) are true  
D) need not be even
10. A graph in which all the nodes are of equal degree is called  
A) Multi graph  
B) non- regular graph  
C) regular graph  
D) Complete graph
11. A tree with  $(N+1)$  vertices contains -  
A)  $(N-1)$  edges  
B)  $(N^2-1)$  edges  
C)  $N$  edges  
D)  $(N+1)$  edges
12. If a tree has only one center, it is called  
A) Bi-Central Tree  
B) Labeled Tree  
C) Rooted Tree  
D) Central Tree

13. A graph with  $n$  vertices and  $(n-1)$  edges that is not a tree is:
- (A) Euler  
(B) Circuit  
(C) Disconnected  
(D) Connected
14. Which of these adjacency matrices represents a simple graph?
- (A)  $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}$   
(B)  $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$   
(C)  $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$   
(D)  $\begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$
15. The maximum number of possible non zero values in an adjacency matrix of a simple graph with  $n$  vertices is -
- (A)  $n^2$  (B)  $(n-1)^2$   
(C)  $n(n-1)$  (D) None of these
16. Determine which of the following statement(s) is/are not true.
- (A) The chromatic number of  $K_n$  is  $n$ .  
(B) The chromatic number of any cycle is 2.  
(C) The chromatic number of any nontrivial tree is 2.  
(D) Every planar graph is not 4 colorable.
17. Chromatic number of cube is -
- (A) 3 (B) 4  
(C) 5 (D) None of these
18. The maximum number of cut set matrices formed from a graph with  $n$  vertices is -
- (A)  $n^{n-1}$  (B)  $n^n$   
(C)  $n^{n-2}$  (D)  $n^{n+1}$
19. No. of possible spanning trees in  $C_n$  is -
- (A)  $n$  (B)  $n-1$   
(C)  $n^{n-2}$  (D) None of these
20. DFS can be used to find the presence of
- (A) Hamiltonian cycle in a graph (B) Eulerian circuit in a graph  
(C) Cycle in a connected graph (D) MST
21. How many linked lists are used to represent a graph with  $n$  nodes and  $m$  edges, when using an edge list representation?
- (A)  $m$  (B)  $n$  (C)  $m+n$  (D)  $mxn$
22. Which of the following statements for a simple graph is correct?
- (A) Every path is a trail  
(B) Every trail is a path  
(C) Every trail is a path as well as every path is a trail  
(D) None of the mentioned
23. Maximum number of edges in a planar graph with  $n$  vertices is -
- (A)  $(2n-4)$  (B)  $n$   
(C)  $(3n-6)$  (D) None of these
24. To find the shortest path in a weighted graph, which of the following is not used?
- (A) Dijkstra's algorithm (B) Warshall's algorithm  
(C) Prim's algorithm (D) None of these
25. How many edges are there in forest of  $t$  trees containing a total of  $n$  vertices?
- (A)  $(n+t)$  (B)  $n-t$   
(C)  $n^t$  (D)  $nt$
26. The number of edges which must be removed from a connected graph with  $n$  vertices and  $m^2$  edges to produce a spanning tree is
- (A)  $m^2-n-1$  (B)  $m-n-1$   
(C)  $m-n+1$  (D)  $m^2-n+1$
27. The maximum number of edges in a disconnected graph with  $n$  vertices is:
- (A)  $n(n-1)$  (B)  $(n-1)(n-2)/2$   
(C)  $n(n-1)/2$  (D) None of these
28. The maximum clique size of a planar graph is
- (A) 2 (B) 3  
(C) 4 (D) 5
29. The dimension of incidence matrix of a graph  $G=(V, E)$  is -
- (A)  $|V| \times |E|$   
(B)  $|V| \times |V|$   
(C)  $|E| \times |E|$   
(D) None of these
30. A minimal spanning tree of a graph  $G$  is.... ?
- (A) A spanning sub graph  
(B) A tree  
(C) MST  
(D) All of these

## **SECTION - B**

[ There are 10 short type questions, each carrying 2 marks. Answer all the questions. ]

31. Give some applications of graph theory. What are the possible connection schemes (*i.e.*, graphs) in computer networks. [1+1]
32. The degree sequence of a simple undirected graph with  $n$  vertices is  $(n-1), (n-1)$  up to  $n$ . Find the diameter of the graph. Find the complement of the  $C_5$  graph. [1+1]
33. Multiple graphs can have the same adjacency matrix. Justify the truth of the statement. [2]
34. Can we find ST (spanning tree) or MST for directed graph? Justify your answer. [2]
35. Give an example of graph which has neither a Hamiltonian cycle nor an Eulerian circuit. [2]
36. Distinguish between  $k$ -coloring of graph and chromatic number of graph. [2]
37. Does adding or deleting loops, parallel edges affect the planarity of a graph. Explain. [2]
38. What is non-planar graph? Why are we interested to find crossing and thickness of non-planar graph? [1+1]
39. Finding the largest complete subgraph of graph ( $G$ ) tells us to find the chromatic number of graph. – Justify the truth of the statement. [2]
40. What is flow network? Give some applications of flow network. [2]



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