

KATHMANDU UNIVERSITY
End Semester Examination
June/July, 2023

Marks Scored:

Level : B.Sc.
Year : III

Course : COMP 323
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date **7 1 JUL 2023**

SECTION "A"

[20 Q. × 0.5 = 10 marks]

Write the most appropriate answer in the space given in the 'Correct Answer' row in the ANSWER BOX given below.

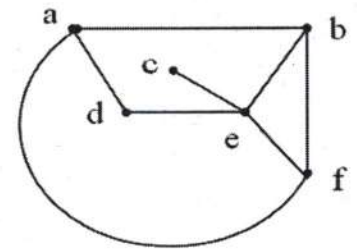
ANSWER BOX

Question No.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Correct Answer										

Question No.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
Correct Answer										

1. The complete bipartite graph $K_{4,7}$ consists of :
- A. 4 vertices and 7 edges. B. 7 vertices and 4 edges.
C. 8 vertices and 14 edges. D. 11 vertices and 28 edges.

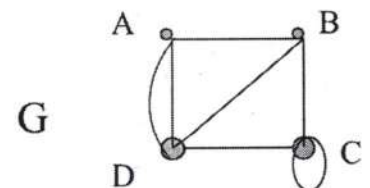
2. The order and size of the given graph is equal to:
- A. Order = 6 & degree = 8. B. Order = 8 & degree = 6.
C. Order = 6 & degree = 6. D. Order = 8 & degree = 8.



3. A Petersen graph has:
- A. 10 edges B. 15 edges.
C. 12 vertices. D. 15 vertices.

4. Which statement regarding tree T of order n is **FALSE**?
- A. Then tree T has $n - 1$ edges.
B. Then there are n^{n-2} trees.
C. A connected graph is a tree if and all its edges are bridges.
D. Then tree T has $n - 1$ leaves.

5. The degree of vertices A, B, C and D in the graph G are:
- A. A = 3, B = 3, C = 2, D = 4
B. A = 3, B = 3, C = 3, D = 4
C. A = 3, B = 3, C = 4, D = 4
D. A = 3, B = 2, C = 2, D = 4



6. Which statement regarding a binary tree is **TRUE**?

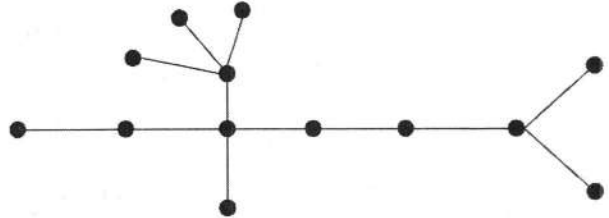
- A. The number of vertices is always even.
- B. The number of vertices is always odd.
- C. The number of leaves is always even.
- D. The number of leaves is always odd.

7. The number $100!$ is a number with digits.

- A. 100
- B. 133
- C. 144
- D. 158

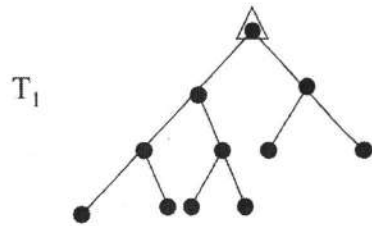
8. The diameter of the given tree is equal:

- A. 3
- B. 4
- C. 6
- D. 7



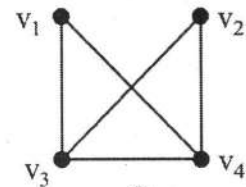
9. The path length of the given tree is equal to:

- A. 6
- B. 9
- C. 11
- D. 16



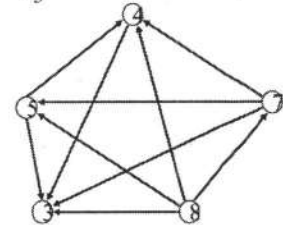
10. The number of spanning trees that can be formed from the given tree is:

- A. 4
- B. 6
- C. 8
- D. 12



11. The given digraph represents the binary relation:

- A. "less than" on a set of five numbers $\{3, 4, 5, 7, 8\}$.
- B. "greater than" on a set of five numbers $\{3, 4, 5, 7, 8\}$.
- C. "equal to" a set of five numbers $\{3, 4, 5, 7, 8\}$.
- D. "on to" on a set of five numbers $\{3, 4, 5, 7, 8\}$.



12. Which one of the following statements regarding the chromatic number $\chi(G)$ of a graph with n vertices is **NOT TRUE**?

- A. $\chi(G) \leq n$.
- B. $\chi(G) \leq \Delta(G) + 1$
- C. $\chi(G) \leq \Delta(G) - 1$
- D. $\chi(G) \leq \Delta(G)$

13. The chromatic number of the bipartite graph $K_{3,3}$ is equal to:

- A. 2
- B. 3
- C. 6
- D. 9

14. In a simple connected planar graph with r regions, n vertices and e edges:

- A. $e \geq 3r$
- B. $2e \geq 3r$
- C. $e \leq n - 6$
- D. $e \leq n - 3$

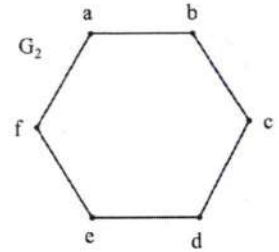
15. Dodecahedron is a regular polyhedral where the number of vertices V , edges E and faces F are:

- A. $V = 12, E = 30, F = 20$
- B. $V = 12, E = 30, F = 12$
- C. $V = 20, E = 30, F = 20$
- D. $V = 20, E = 30, F = 12$

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16. Which one of the statements regarding self-dual graph is **FALSE**?
- A. Four-vertex complete graph is self-dual.
 - B. If a planar graph G is isomorphic to its own dual, it is self-dual.
 - C. A graph has a self-dual if and only if it is planar.
 - D. A graph always has a self-dual.

17. The independence number of the given graph:
- A. 2.
 - B. 3.
 - C. 4.
 - D. 6.



18. Which statement related to Four Color Conjecture is **FALSE**?
- A. This conjecture is equivalent to the statement: every planar graph is 4-colorable.
 - B. Part of the proof uses computer and cannot be verified by hand.
 - C. The part that is supposedly hand-checkable has been independently verified in its entirety.
 - D. In 1976 Appel and Haken proved the conjecture positively.
19. According to the Boolean algebra postulate, $x + x' =$
- A. 0.
 - B. 1.
 - C. x .
 - D. x' .
20. When the bipartite sets have the same size, Hall's theorem is also known as:
- A. Marriage theorem.
 - B. Tournament.
 - C. Covering.
 - D. Saturation.

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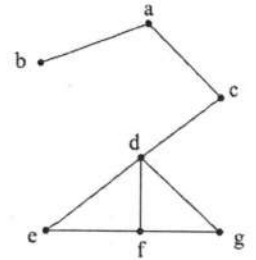
Level : B.Sc.
Year : III
Time : 2 hrs. 30 mins.

Course : COMP 323
Semester: II
F.M. : 40

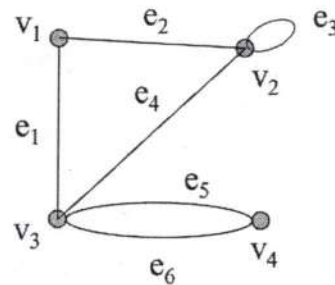
SECTION "B"
Short Answer Questions
[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

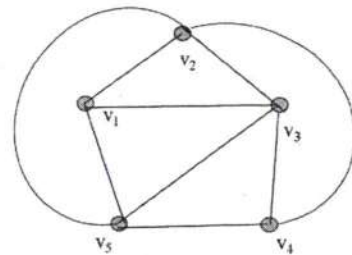
1. Find the two cut-vertices and two bridges in the given graph. [2+ 2]



2. Write the degree matrix of the given graph.



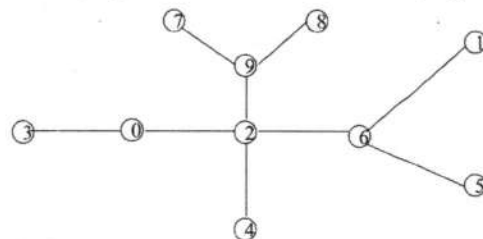
3. Embed the given simple planar graph in the plane such that every edge is drawn as a straight line segment.



4. What is Petersen graph? Find the chromatic number of this graph. [1 + 3]

5. Sketch two binary trees with 11 vertices. Find path length in each of these binary trees. [2 + 2]

6. Represented the given graph as an adjacency matrix and then calculate the number of bits required to store this graph. [2 + 2]



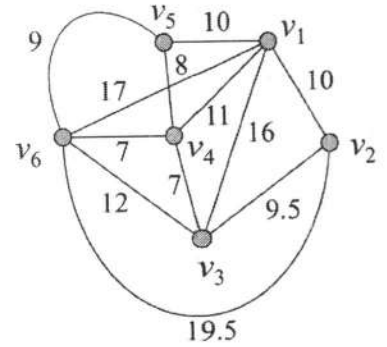
7. What is an Eulerian graph? How Euler proved that the problem of the Konigsberg Bridge has no solution? [2 + 2]

[2 + 2]

SECTION "C"
Long Answer Questions
 [2 Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. How Prim's algorithm is implemented?
 Apply Prim's algorithm to find the Shortest Spanning Tree in the given weighted graph. [2 + 6]



9. What is Kuratowski graph? Why is it called the graph of fundamental importance? Draw Kuratowski graphs. State six of its properties. [2 + 1 + 2 + 3]
10. Define matching and a maximal matching in a graph.
 For the matching $M = \{ca, gf, de, hi\}$ in the given graph below find:
 M-alternating path and M-augmenting path. [2 + 2 + 2 + 2]

