KATHMANDU UNIVERSITY
End-Semester Examination
February/March, 2019

Marks Scored:

Level : B.Sc.
Year : III

Course : COMP 323
Semester: II

Exam Roll No.:

Time: 30 mins.

F. M. : 10

Registration No.:

Date : 07 MAR 2019

SECTION "A"

[20 Q. × 0.5 = 10 marks]

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

ANSWER BOX

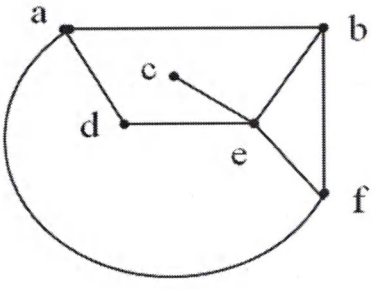
Question No.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Correct Answer										

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

1. In a graph G with n vertices and e edges, the degree of a vertex v is :
   A. the number of edges e in the graph.
   B. the number of vertices v in the graph.
   C. the cardinality of the neighborhood of vertex v.
   D. twice the number of edges.

2. Which one of the statement, regarding a complete graph K_n, is **not true**?
   A. It is a $(n-1)$ regular graph.
   B. Every vertices are adjacent.
   C. The complete graph K_4 has 6 edges.
   D. The complement of the complete graph K_4 has 6 edges.

3. The order of the given graph is equal to:
   A. 6.
   B. 8.
   C. 12.
   D. 14.



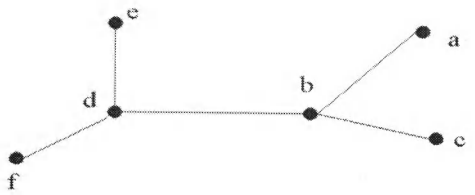
4. Which one of the statements, regarding the k-cube graph Q_4, is **not true**?
   A. It has 16 vertices.
   B. It has 32 edges.
   C. It is 3-regular graph.
   D. Vertices (1001) and (1010) are adjacent.

5. In a Petersen graph, the sum of the degrees of all its vertices is equal to:
   A. 10 B. 15 C. 25 D. 30

6. The tree of order 10 has:
   A. 5 edges B. 9 edges C. 14 edges D. 19 edges

7. The minimum possible height of an n-vertex binary tree is given by:
   A. $[\log_2(n+1) - 1]$ B. $[\log_2(n+1) + 1]$ C. $[\log_2(n-1) - 1]$ D. $\lfloor \log_2(n-1) + 1 \rfloor$

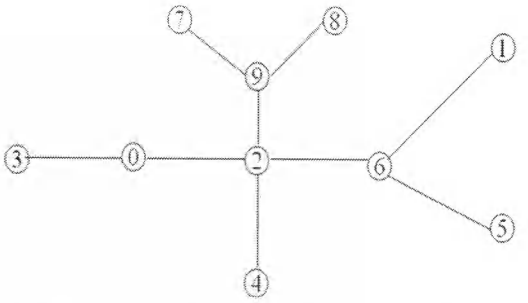
8. The diameter of the given tree is equal to:
   A. 2 B. 3
   C. 4 D. 6



9. The number of all trees that can be constructed with 6 vertices is equal to:
   C. 6^2 B. 6! C. 2^6 D. 6^4

10. For a graph of order n with k components and e edges, the nullity μ is calculated using the formula:
    A. $\mu = e + n + k$
    B. $\mu = e - n + k$
    C. $\mu = e + n - k$
    D. $\mu = e - n - k$

11. The number of minimum bits required to store the given tree with an adjacency matrix is equal to:
    A. 100 B. 75
    C. 50 D. 45

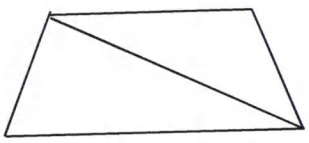


12. Which one of the following statements regarding the Kuratowski's graph is **not true**?
    A. Kuratowski's graph of first kind is isomorphic with the three-utilities problem.
    B. Kuratowski's graph of second kind is isomorphic with the three-utilities problem.
    C. First graph of Kuratowski is the nonplanar graph with the smallest number of vertices.
    D. Second graph of Kuratowski is the nonplanar graph with the smallest number of edges.

13. The total number of different Hamiltonian circuits in a complete graph of n vertices is equal to:
    A. (n - 1)/2 B. (n + 1)/2 C. (n - 1)!/2 D. (n + 1)!/2

14. The chromatic number of the graph C_5 is equal to:
A. 2 B. 3 C. 4 D. 5

15. The *matching number* of the given graph is equal to,
A. 2 B. 3
C. 4 D. 5



16. In a bipartite graph a complete matching of V_1 into V_2 exists if there is a positive integer m for which the following condition is satisfied:
A. degree of every vertex in $V_1 = m =$ degree of every vertex in V_2.
B. degree of every vertex in $V_1 > m >$ degree of every vertex in V_2.
C. degree of every vertex in $V_1 \geq m \geq$ degree of every vertex in V_2.
D. degree of every vertex in $V_1 \leq m \leq$ degree of every vertex in V_2.

17. The Gale-Shipley algorithm produces:
A. a stable marriage
B. a minimal spanning graph
C. a shortest path between vertices in a graph
D. the critical path

18. According to the Boolean algebra postulates:
A. $x + x = 0$ B. $x + 1 = 1$ C. $x + x = 1$ D. $x\,x' = 1$

19. The number of faces in a polyhedral Dodecahedron is equal to:
A. 10 B. 12 C. 16 D. 20

20. Let $S_1 = \{1, 2, 3\}$; $S_2 = \{1, 4, 5\}$; $S_3 = \{3, 5\}$, then an SDR for $X = \{S_1, S_2, S_3\}$ is equal to?
A. $\{1, 2, 3\}$ B. $\{2, 3, 3\}$ C. $\{1, 2, 5\}$ D. $\{3, 5, 5\}$

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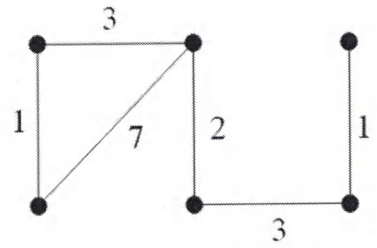
SECTION "B"
Short Answer Questions
[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

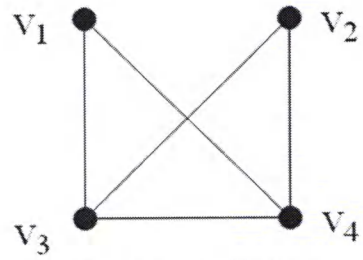
1. Sketch the Königsberg Bridge and draw its corresponding graph. [2+ 2]

2. Find the two spanning trees for the given graph. [2 + 2]

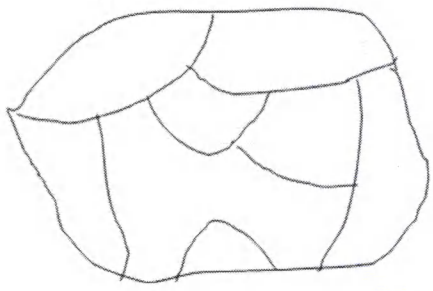


3. Draw the planar graph for the two regular polyhedral: tetrahedron and octahedron. [2 +2]

4. Write the adjacency matrix and degree matrix for the given graph. [2 + 2]

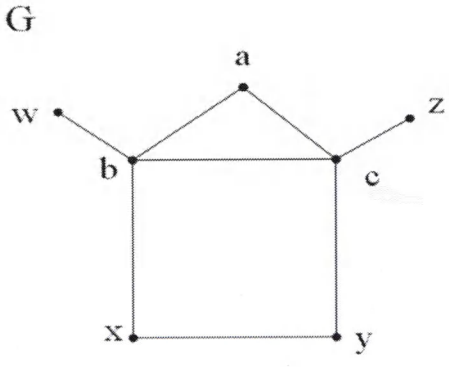


5. The given figure represents a map of 8 countries. Find the minimum number of different colors required to color the map so that the neighboring countries have different colors. [4]



6. Draw the shortest and longest binary tree with 13 vertices. [2 + 2]

7. For the given graph G, draw the graph: [2 + 2]
   a. G - bc;
   b. G/bc

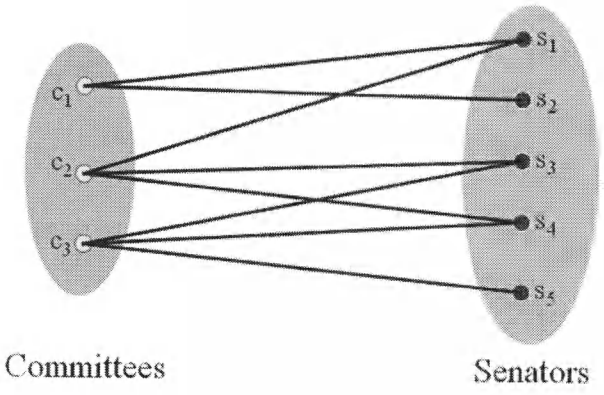


SECTION "C"
Long Answer Questions
[2 Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. What are the differences between Binary Tree (BT) and Binary Search Tree (BST)? Sketch the BST for the following intersections:
38, 13 51, 10, 12, 40, 84, 25, 89, 37, 66, 95. [3 + 5]

9. The membership of the 5 Senators in 3 Committees are represented by the following graph:



Find the matrix X_{12} of the adjacency matrix of this graph in the format:. $X(G) = \begin{bmatrix} 0 & X_{12} \\ X_{12}^T & 0 \end{bmatrix}$

Format the matrix X_{12} so that there is a complete matching of Committees and Senators.
[5 + 3]

10. Given below is a Contact Network. Write down its Transmission matrix T and the Primitive Connection matrix Q. [4 + 4]