

KATHMANDU UNIVERSITY
End Semester Examination
May/June, 2022

Marks Scored:

Level : B.Sc.

Year : III

Course : COMP 323

Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date :

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.

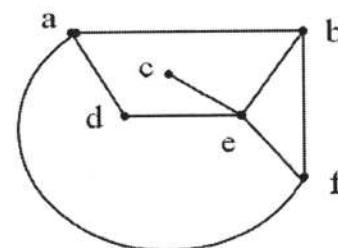
ANSWER BOX

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 number of different graphs we can make from a set of 4 vertices is:
 A. 4. B. 16. C. 64. D. 256.

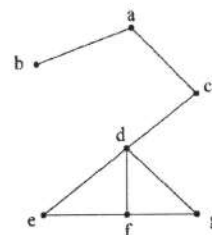
2. The order of the given graph is equal to:
 A. 6. B. 8.
 C. 14. D. 15.



3. A subgraph H of graph G is an induced subgraph if:
 A. $E(H) = E(G)$
 B. $E(H) \cup E(G)$.
 C. $E(H) = E(G) \cap E(V(H))$.
 D. $E(H) = E(G) \cup E(V(H))$.

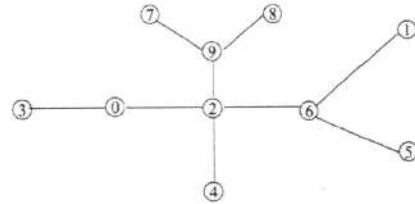
4. The complete bipartite graph $K_{m,n}$ consists of:
 A. $m \times n$ vertices and $(m+n)$ edges.
 B. $m \times n$ vertices and $m \times n$ edges.
 C. $(m+n)$ vertices and $(m+n)$ edges.
 D. $(m+n)$ vertices and $m \times n$ edges.

5. How many bridges are there in the given graph?
 A. 3 B. 5
 C. 7 D. 8

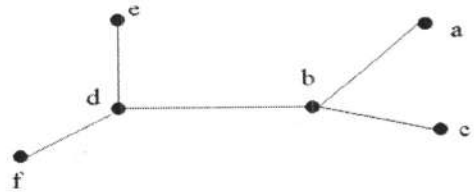


6. Which statement regarding k-cube is **FALSE**?
- The k-cube is bipartite.
 - The k-cube is k-regular.
 - The order of k-cube graph is 2^k .
 - The degree of k-cube graph is 2^{k-1} .

7. The given graph is represented by a matrix. The number of bits required to store is:
- 100.
 - 50.
 - 25.
 - 10.



8. The center of the given tree is equal:
- b
 - d
 - both b and d.
 - none.



9. In a binary tree with 13 vertices, the number of leaves are:
- 4
 - 5
 - 6
 - 7

10. The number of regions r formed by a connected planar graph with n vertices and e edges is given by the relation:

A. $r = e + n + 1$ B. $r = e - n + 1$ C. $r = e + n + 2$ D. $r = e - n + 2$

11. The chromatic number of the graph $K_{5,3}$ is equal to:

A. 2 B. 3 C. 5 D. 8

12. A graph with n vertices is a tree if and only if:

- it is connected and contains $n - 1$ edges.
- number of vertices in $V_1 - \text{deficiency } \delta(G)$.
- number of vertices in $V_1 - \text{number of vertices in } V_2$.
- number of vertices in $V_2 - \text{number of vertices in } V_1$.

13. Which one of the statement regarding the Kuratowski's graphs is **TRUE**?

- First graph of Kuratowski K_5 is the nonplanar graph with the smallest number of edges.
- Second graph of Kuratowski $K_{3,3}$ is the nonplanar graph with the smallest number of vertices.
- Both K_5 and $K_{3,3}$ are planar graphs.
- Removal of an edge and a vertex makes K_5 or $K_{3,3}$ a graph planar.

14. 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. $\{1, 4, 5\}$. D. $\{4, 4, 5\}$.

15. Which of the postulate of the Boolean algebra is **NOT CORRECT**?

A. $x + 1 = 1$. B. $x + x' = 0$. C. $x + x = x$. D. $x \cdot x' = 0$.

16. A graph has a dual if and only if the graph is:

- bipartite.
- complete.
- connected.
- planar.

17. Which one of the statement regarding the Hamiltonian path is **FALSE**?
- A. Hamiltonian path in a graph G traverses every vertex of G .
 - B. Hamiltonian path is a subgraph of a Hamiltonian circuit.
 - C. The length of a Hamiltonian path in a connected graph of n vertices is $n - 1$.
 - D. Hamiltonian path is obtained from by walking along Hamiltonian circuit.
18. In any graph, the relation between chromatic number $\chi(G)$ and clique number $\omega(G)$ is given by:
- A. $\chi(G) \geq \omega(G)$.
 - B. $\omega(G) \geq \chi(G)$.
 - C. $\chi(G) \geq \omega(G) + 1$.
 - D. $\omega(G) \geq \chi(G) + 1$.
19. Icosahedron is a regular polyhedral where the number of vertices V , edges E and faces F are:
- A. $V = 20, E = 30, F = 12$.
 - B. $V = 12, E = 30, F = 20$.
 - C. $V = 30, E = 20, F = 12$.
 - D. $V = 12, E = 20, F = 30$.
20. Them matching M in a graph G is maximum if and only if:
- A. G contains no M -saturated vertices.
 - B. G contains no M -unsaturated vertices.
 - C. G contains no M -alternating paths.
 - D. G contains no M -augmenting paths.



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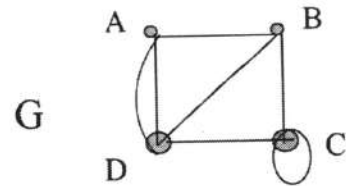
Level : B. Sc.
Year : III
Time : 2 hrs. 30 mins.

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

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

Attempt *ANY SIX* questions.

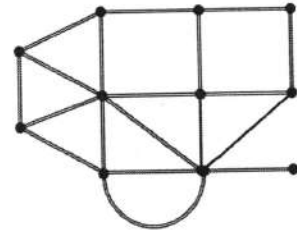
1. Find the following for the given graph: [2+ 2]
a. Degree of the vertices D & C;
b. Edge set.



2. Draw the graph whose adjacency matrix is: [4]

$$\begin{pmatrix} 0 & 1 & 2 & 0 \\ 1 & 1 & 1 & 1 \\ 2 & 1 & 0 & 0 \\ 0 & 1 & 0 & 1 \end{pmatrix}$$

3. The given graph represents the street map of a part of a city. Each of the vertices is a potential trouble spot and must be kept under the surveillance of a patrol car. What is the minimum of patrol cars required? [4]



4. Write down the formula for the minimum possible height of an n -vertex binary tree and draw such a tree for $n = 11$. [2 + 2]
5. What is number of labeled trees with n vertices. Draw all labeled trees for $n = 3$. [2 + 2]
6. Draw a digraph to represents the binary relation "greater than" on a set of five numbers {3, 4, 5, 7, 8}. [4]
7. What is an Eulerian graph? How Euler proved that the problem of the Königsberg has no solution? [2 + 2]

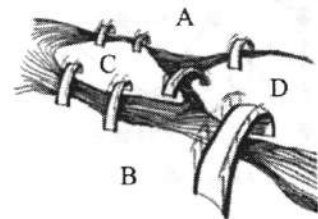
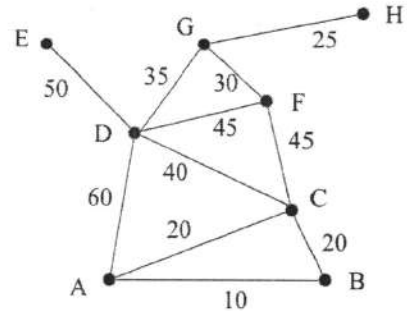


FIGURE 1.1. The bridges in Königsberg.

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

Attempt *ANY TWO* questions.

8. How Kruskal's algorithm is implemented? Apply Kruskal's algorithm to find the minimum spanning tree in the given network of roads between the cities. [2 + 6]



9. Suppose want to schedule some final exams for eight Computer courses with following code numbers:
 1007, 3137, 3157, 3203, 3261, 4115, 4118, 4156
 Suppose also that there are **no common students** in the following pairs of courses because of prerequisites:
 1007-3137
 1007-3157, 3137-3157
 1007-3203
 1007-3261, 3137-3261, 3203-3261
 1007-4115, 3137-4115, 3203-4115, 3261-4115
 1007-4118, 3137-4118
 1007-4156, 3137-4156, 3157-4156
 Use coloring of graph to find how many exam slots are necessary to schedule exams? [8]
10. A project is described by the following activity network. Find the Critical Path in the given project first by tabulating the earliest & latest event times. [6 + 2]

