

KATHMANDU UNIVERSITY
End Semester Examination
July/August, 2024

Marks Scored:

Level : B.Sc.

Year : III

Course : COMP 323

Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 10

Registration No.:

Date :

12 AUG 2024

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.

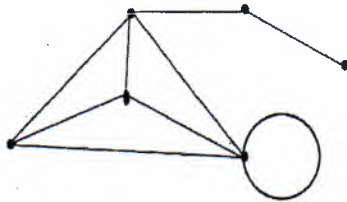
ANSWER BOX

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 maximum degree of any vertex in a simple graph with n vertices is _____.
 A. $n - 1$ B. $n + 1$ C. $2n + 1$ D. n
2. A graph with one vertex and no edges is _____.
 A. Multi-graph B. Digraph C. Isolated graph D. Trivial graph
3. Which of the following could be the number of odd vertices in a graph?
 A. 3 B. 5 C. 1 D. 0
4. Arthur-Cayley formula for simple connected graph determines _____.
 A. the number of edges of a tree.
 B. the number of spanning trees of any graph.
 C. the number of spanning trees of a complete graph.
 D. the number of paths in a graph.
5. A tree with at least two vertices contains _____.
 A. at most two pendant vertices.
 B. at least two pendant vertices.
 C. exactly one pendant vertex.
 D. not more than one pendant vertices.

6. Which of the following statement about the binary tree is **CORRECT**?
- A. Every binary tree is either complete or full.
 B. Every complete binary tree is also a full binary tree.
 C. Every full binary tree is also a complete binary tree.
 D. A binary tree cannot be both complete and full.
7. The number of vertices in polyhedron which has 30 edges on 12 faces is _____.
- A. 12 B. 15 C. 20 D. 24
8. The least number of edges in the non-planar graph is _____.
- A. 7 B. 8 C. 9 D. 10
9. The number of regions in the graph below is _____.



- A. 4 B. 5 C. 6 D. 7
10. Which of the following is incorrect?
- A. K_n is planar if and only if $n \leq 4$.
 B. $K_{m,n}$ is planar if and only if $m \leq 2$ or $n \leq 2$.
 C. $K_{m,n}$ is planar if and only if $m \leq 2$ and $n \leq 2$.
 D. A graph is planar if and only if it contains no subgraph homeomorphic to K_5 or $K_{3,3}$.
11. A graph has its dual if and only if the graph is _____.
- A. regular B. bipartite C. planar D. complete
12. The total number of different Hamiltonian circuits in a complete graph K_n is _____.
- A. $\frac{n-1}{2}$ B. $\frac{n+1}{2}$ C. $\frac{(n-1)!}{2}$ D. $\frac{(n+1)!}{2}$
13. The chromatic number of graph $K_{3,2}$ is _____.
- A. 1 B. 2 C. 3 D. 4
14. In any graph G , 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. $\omega(G) \geq \chi(G) + 1$
15. Let $S_1 = \{2, 8\}, S_2 = \{8\}, S_3 = \{5, 7\}, S_4 = \{2, 4, 8\}$, then SDR for $X = \{S_1, S_2, S_3, S_4\}$ is equal to _____.
- A. $\{2, 4, 5, 7\}$ B. $\{2, 4, 5, 8\}$ C. $\{2, 4, 7, 8\}$ D. $\{4, 5, 7, 8\}$

16. Which one of the postulate of the Boolean algebra is not true?
A. $x + x' = 1$ B. $xx' = 1$ C. $x_i + x_i x_j = x_i$ D. $1 + x = 1$
17. A complete asymmetric digraph is called _____.
A. Covering B. Saturation C. Tournament D. Matching
18. Which of the following describes the relationship between transmission matrix and primitive connection matrix?
A. $T = Q^n$ B. $T = Q^{-1}$ C. $T = Q^{n-1}$ D. $T = Q^{n+1}$
19. If a delay in an activity will delay completion of the whole project, the activity _____.
A. is on the critical path B. has slack
C. is costly D. is a dummy
20. What is a critical path?
A. It is a path that operates from the starting node to the end node.
B. It is a mixture of all the paths.
C. It is the longest path
D. It is the shortest path

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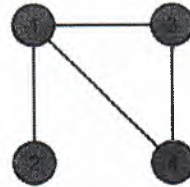
12 AUG 2024

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

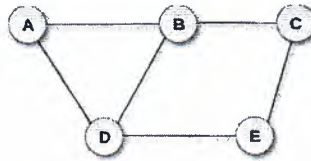
SECTION "B"
Short Answer Questions
[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

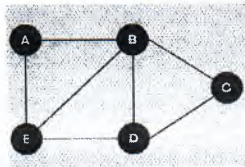
1. Find the adjacency matrix A of the given graph. Also, find A^2 and A_{\odot}^2 and explain what does the entries of these matrix represent? [1+1+1+1]



2. State Kirchhoff theorem for the number of spanning trees of a simple connected graph. Find the number of spanning trees of the graph given below. [1+3]



3. What do you mean by full and complete binary trees? Give examples of binary tree which is (i) complete but not full and (ii) full but not complete. [1+1.5+1.5]
4. Define chromatic number? Find the chromatic polynomial of the path graph P_4 by successively removing the edges. [1+3]
5. Define dual graph. Draw the dual graph of the given graph below. [1+3]



6. What do you mean by regular polyhedron? Verify the Euler formula for the number of faces, number of edges and number of vertices of the Octahedron. [1+3]
7. What do you mean by matching? Use Gale-Shapely algorithm to find the stable matching based on the following preferences of men and women separately. [1+1.5+1.5]

	1	2	3	4	5
Mack	Winnie	Wilma	Wanda	Walda	Wendy
Mark	Wanda	Winnie	Wendy	Wilma	Walda
Marv	Winnie	Walda	Wanda	Wilma	Wendy
Milt	Winnie	Wilma	Wanda	Wendy	Walda
Mort	Wanda	Winnie	Walda	Wilma	Wendy

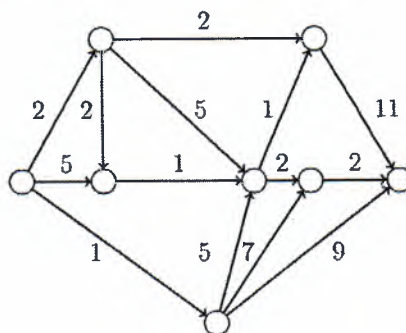
P.T.O.

	1	2	3	4	5
Walda	Milt	Mort	Mack	Mark	Marv
Wanda	Milt	Marv	Mort	Mark	Mack
Wendy	Mort	Mack	Milt	Mark	Marv
Wilma	Mark	Mort	Milt	Mack	Marv
Winnie	Marv	Mort	Mark	Milt	Mack

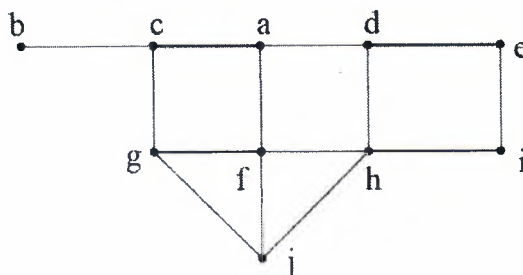
SECTION "C"
Long Answer Questions
 [2 Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Find the critical path and the duration of the project from the activity network below. Also, find the maximum permissible delay in the non-critical activities. [3+2+3]



9. Define M-alternating and M-augmenting paths in a graph. For the matching $M = \{ca, gf, de, hi\}$ in the graph given below, find M-alternating and M-augmenting paths. [2+2+2+2]



10. Four applicants **a**, **b**, **c** and **d** are available to fill six vacant positions **u**, **v**, **w**, **x**, **y** and **z**.
- Applicant **a** is qualified to fill the position **v** and **y**.
 - Applicant **b** is qualified to fill the position **v** and **y**.
 - Applicant **c** is qualified to fill the position **v** and **y**.
 - Applicant **d** is qualified to fill the position **u**, **v**, **w**, **x** and **z**.

Represent the situation by an appropriate graph. Tabulate this situation and find the deficiency of this graph. [3+3+2]