KATHMANDU UNIVERSITY
End Semester Examination
August/September, 2017

Mark Scored:

Level : B. Sc.
Year : III
Course : COMP 323
Semester : II
Exam Roll No. :
Time: 30 min
F. M. : 10
Registration No.:
Date : SEP 13 2017

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

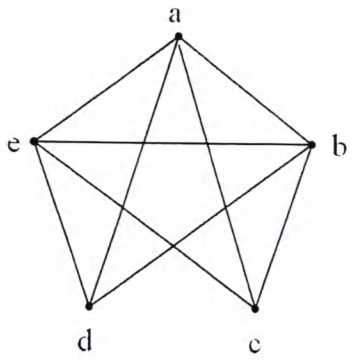
Question No.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Correct Answer										

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

1. In a graph G with n vertices,:
   A. the sum of the degrees is equal to $2n$.
   B. the sum of the degrees is equal to $2(n + 1)$.
   C. the number of vertices with even degree is odd.
   D. the number of vertices with odd degree is even.

2. Which one of the statement, regarding a complete graph K_5 is **not true**?
   A. It has 5 vertices.
   B. It has 10 edges.
   C. It is a 5-regular graph.
   D. The sum of the degrees of this graph is 20.

3. The independence number $\beta(G)$ for the given graph is equal to:
   A. 2
   B. 3
   C. 4
   D. 6

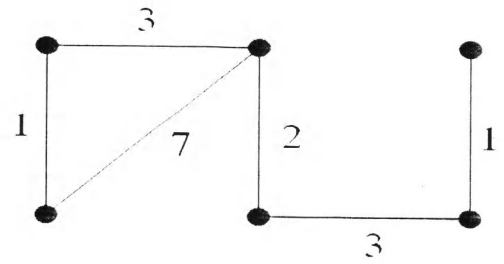


4. From the given 5 vertices, the number of different graphs that can be constructed are
   A. 25
   B. 32
   C. 1024
   D. 3125

5. The number of edges of a k-cube graph with k = 4 is equal to:
   A. 16
   B. 32
   C. 64
   D. 256

6. The number of labeled trees with 8 vertices is equal to :
   A. 256
   B. 1024
   C. 4096
   D. 16384

7. The number of spanning graphs that can be obtained for the given graph is:
   A. 2
   B. 3
   C. 4
   D. 5



8. Which one statement among the following statements related to planar graph is **true**?
   A. First graph of Kuratowski K_5 is the nonplanar graph with the smallest number of edges.
   B. Second graph of Kuratowski $K_{3,3}$ is the nonplanar graph with the smallest number of vertices.
   C. A complete graph of four vertices K_4 is planar.
   D. A graph has a dual if and only if it is nonplanar.

9. The chromatic number $\chi(T)$ of a tree T with 12 vertices is equal to:
   A. 2
   B. 3
   C. 4
   D. 6

10. The number of faces in a regular polyhedral Dodecahedron is equal to:
   A. 8
   B. 12
   C. 16
   D. 20

11. A given connected graph G is an Euler graph if and only if:
   A. the number of vertices of G is odd.
   B. the number of vertices of G is even.
   C. all the vertices of G are of odd degree.
   D. all the vertices of G are of even degree.

12. For the graph G, where $G = P_4$, the chromatics polynomial $C_G(k)$ is given by:
   A. $k^4 - k^3 + k^2 - k$
   B. $k^4 - 3k^3 + 2k^2 - k$
   C. $k^4 - k^3 - 3k^2 - k$
   D. $k^4 - 3k^3 + 3k^2 - k$

13. Which one of the statement regarding the binary tree is **not true**?
   A. The number of vertices *n* in a binary tree is always odd.
   B. The number of vertices *n* in a binary tree is always even.
   C. Let *p* be the leaves in a binary tree. Then *n-p*-1 is the number of vertices of degree three.
   D. Except for the root, each of the remaining vertices is of degree one or three.

14. How many digits do 100! have?
   A. 100
   B. 158
   C. 185
   D. 200

15. Petersen graph is a graph:
   A. is a 3-regular graph of order 10.
   B. is a 3-regular graph of order 9.
   C. is a 4-regular graph of order 10.
   D. is a 4-regular graph of order 12.

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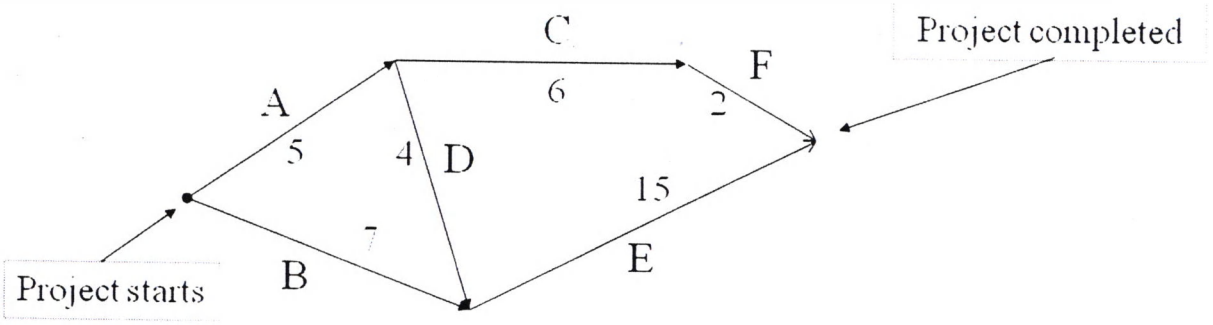
16. Which one of the postulate of the Boolean Algebra is **true**?
A. $x + x' = 1$
B. $x + x = 1$
C. $x + 1 = 1$
D. $x . x = 1$

17. From the given 5 vertices, we can make only 3 unlabelled trees. The number of trees that can be made if the vertices are labeled will be equal to:
A. 15
B. 25
C. 75
D. 125

18. An M-augmenting path is:
A. an M- augmenting path where the edges alternate between edges in M and edges not in M.
B. an M-augmenting path where both ends are M-unsaturated.
C. an M-alternating path where both ends are M-unsaturated.
D. an M-alternating path where the edges alternate between edges in M and edges not in M.

19. Let G be a bipartite graph with partites V_1 and V_2. The maximum number of edges in a matching in G:
A. equals the minimum number of vertices in an edge cover of G.
B. equals the maximum number of vertices in an edge cover of G.
C. equals the minimum number of vertices in partite V_1.
D. equals the minimum number of vertices in partite V_2.

20. Which one of the statements related to the Activity Network given below is **not true**?
A. The project duration is 24.
B. The project duration is 13.
C. The critical path is ADE.
D. The critical events are A, D & E.



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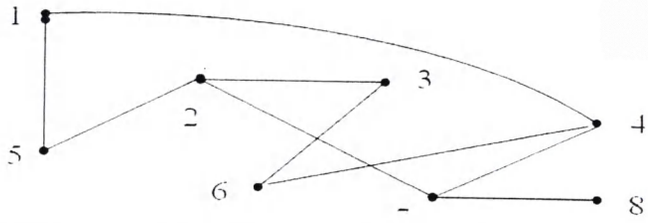
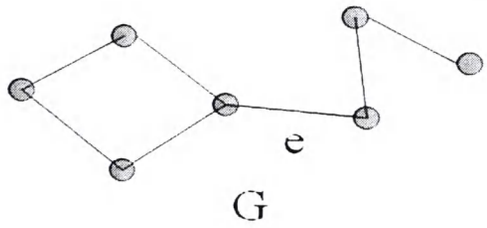
SECTION "B"
(Short answer questions)
[6 Q. × 4 = 24 marks]

Attempt *ANY SIX* questions.

1. For the given graph, find the following: [1 × 4]
   a. Size of the graph.
   b. Order of the graph.
   c. Neighborhood of vertex 2.
   d. Degree of vertex 7.



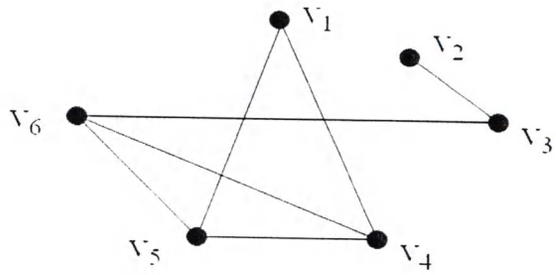
2. For a graph G define the sub-graph G – e, where e an edge of that graaph. Draw G – e for the given graph. [2 + 2]



G

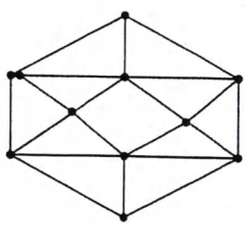
3. Find the rank and nullity in a connected graph with 12 vertices and 7 edges. [2 + 2]

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



5. Sketch two different binary trees with six leaves. Find the path length of each. [2 + 2]

6. Name the given graph and find its chromatic number. [1 + 3]



7. Draw a graph with six vertices to illustrate that maximum matching is not equal to mximal matching. [2 +2]

SECTION "C"
(Long answer questions)
[2 Q. × 8 = 16 marks]

Attempt *ANY TWO* questions.

8. Define a binary tree. What are the main two properties of a binary tree? What is a binary search tree? Draw a binary search tree for the following number sequence {38, 13, 51, 10, 12, 40, 84, 25, 89, 37, 66}, [1 + 2 + 2 + 3]

9. Four applicants a_1, a_2, a_3 and a_4 are available to fill six vacant positions p_1, p_2, p_3, p_4, p_5 and p_6.

   a. Applicant a_1 is qualified to fill position p_2 and p_5.
   b. Applicant a_2 is qualified to fill position p_2 and p_5.
   c. Applicant a_3 is qualified to fill position p_2 and p_5.
   d. Applicant a_4 is qualified to fill position p_1,p_2, p_3, p_4 or p_6.

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

10. Define the transmission of the contact network. What is a Boolean function? Consider the following Contact Network. Find the switching function in the normal form of this Contact Network. [2 + 2 + 4]