

CS16702 – GRAPH THEORY AND APPLICATIONS

(Regulation 2016)

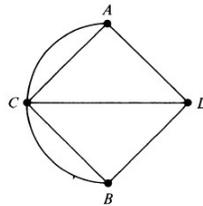
Time: Three hours

Maximum : 80 Marks

Answer **ALL** questions

PART A - (8 X 2 = 16 marks)

1. A simple graph with 10 vertices and 3 components can have at most _____ edges.
 a. 20 b. 24 c. 28 d. 32
2. The number of labeled trees with 6 vertices is
 a. 1196 b. 1296 c. 1396 d. 1496
3. A connected planar graph with 7 vertices and 16 edges has _____ regions.
 a. 14 b.12 c. 13 d. 11
4. A graph with 9 vertices and using 9 colors can be properly colored in _____ ways.
 a. 9! b. 18 c. 81 d. 99
5. Check whether the given graph is an Euler graph. Give reasons.



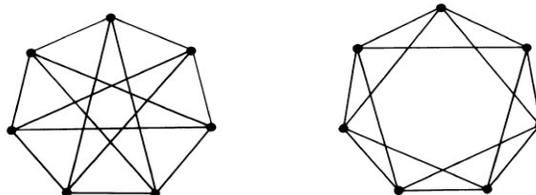
6. Determine the maximum and minimum possible height of a 15-vertex rooted binary tree.
7. Show that the vectors (1, 0, 0, 1, 0) and (0, 0, 1, 0, 1) are orthogonal.
8. Give an example for a bicentroidal tree. Justify it.

PART B - (4 X16 = 64 marks)

09. (a) Name 8 situations (games, activities, real-life problems) that can be represented as by means of graphs. Explain what the vertices and edges denote. **(16)**

(OR)

- (b) (i) Check whether two graphs are isomorphic or not. Give reasons. **(8)**

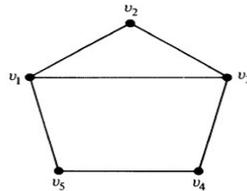


- (ii) Construct a tree to find the largest monotonically increasing subsequence from the given sequence of integers 0, 3, 1, 6, 4, 7. **(8)**

10. (a) Show that the set of the four fourth roots of unity $\{1, -1, i, -i\}$ forms an abelian group. **(16)**

(OR)

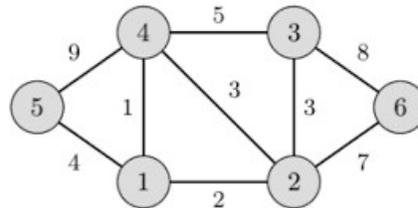
- (b) Find the chromatic polynomial for the given graph. **(16)**



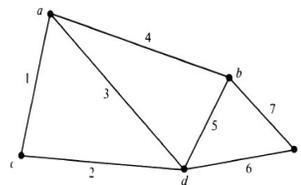
11. (a) How can we apply the concept of Covering in real time. Give any 3 applications. **(16)**

(OR)

- (b) Construct the minimum spanning tree for the following graph using Prim's and Kruskal's algorithm. Explain the steps in detail. Also find the cost of the minimum spanning tree. **(16)**



12. (a) Construct the incidence matrix, adjacency matrix, circuit matrix and path matrix for the given graph. **(16)**



(OR)

- (b) (i) Construct a longest cyclic sequence of 1's and 0's such that no subsequence of 3 bits appears more than once in the sequence. **(8)**
- (ii) Obtain the polish notation for the expression $(a + b * c) - ((d \wedge e + f) / g)$ by constructing an arborescence. **(8)**