

## **CSPE32 Combinatorics and Graph Theory**

### **Mini Project Topics**

Students are supposed to work in groups. Each group should contain 4 students, thus 18 groups. One of the groups can have 3 students.

Two groups can select a particular project from the options given below. These two groups will be evaluated one after the other.

Implement the project using C or C++ as per the requirements.

Don't use library functions for performing major operations of the program.

It is planned to conduct relative grading on this mini-project.

#### **Topics:**

1. Display all possible paths between pair of vertices along with path cost.
2. Find the count of connected components in a graph. Also, display the vertices which are part of each connected component separately.
3. Implementation of KRUSKAL'S algorithm.
4. Implementation of PRIM'S algorithm.
5. Display nodes at a maximum distance of 'm' from a source node.
6. Implementation of cut vertices and separability.
7. Implementation of fundamental circuits.
8. Implementation of TRAVELLING SALES MAN problem using GREEDY APPROACH.
9. Implementation of GRAPH COLOURING using GREEDY APPROACH.
10. Implementation of Fleury's algorithm.
11. Implementation of vertex cover approximation algorithm.
12. Implementation of halls marriage problem.
13. Program to find maximal independent set.
14. Program to find minimal dominating set.
15. Program to find the number of different Hamiltonian Cycle in a graph.
16. Program to find the Single source shortest path (Dijkstra Algorithm ) using Greedy Approach.
17. Implementation of shortest path between all pairs of vertices.
18. Program to find the maximum clique in a graph.

Submit a soft copy of the report by one of the group members to the Project assignment link in MS Teams class group.

Once the implementation is complete, I would like to interact with the group members via an online/offline meeting where I can evaluate your contributions to the project. This can be scheduled in two days (26<sup>th</sup> and 30<sup>th</sup> November 2022) or earlier if a particular group is ready with the project.

### **Evaluation schedule**

#### **Set -1 (26<sup>th</sup> November 2022 from 10.30 AM)**

1. Display all possible paths between pair of vertices along with path cost.
2. Find the count of connected components in a graph. Also, display the vertices which are part of each connected component separately.
3. Implementation of KRUSKAL'S algorithm.
4. Implementation of PRIM'S algorithm.
5. Display nodes at a maximum distance of 'm' from a source node.
6. Implementation of cut vertices and separability.
7. Implementation of fundamental circuits.
8. Implementation of Fleury's algorithm.
9. Program to find maximal independent set.
10. Program to find minimal dominating set.
11. Program to find the maximum clique in a graph.

#### **Set -2 (30<sup>th</sup> November 2022 from 1.30 PM)**

1. Implementation of TRAVELLING SALES MAN problem using Hamiltonian circuit.
2. Implementation of GRAPH COLOURING using GREEDY APPROACH.
3. Implementation of vertex cover approximation algorithm.
4. Implementation of halls marriage problem.
5. Program to find the number of different Hamiltonian Cycle in a graph.
6. Program to find the Single source shortest path (Dijkstra Algorithm) using Greedy Approach.
7. Implementation of shortest path between all pairs of vertices.