**Midterm 2 04/05/23**

**Question 1 (10 points)**: If we apply the BFS algorithm on the following graph, which of these visiting sequences are valid: **ghebfa, bhfeag, abfehg, hbagfe, egabfh**

**The valid sequences are: bhfeag, abfehg, egabfh.**

**Question 2 (10 points)**: If we apply the DFS algorithm on the following graph, which of these visiting sequences are valid: **MNOPQR, QMNPRO, OPNMRQ, ONMQRP, NQPOMR**

**The valid sequences are: MNOPQR, NQPOMR.**

**Question 3 (14 points)** Dilbert has just finished college and decided to celebrate this important moment of his life by drinking a lot. He bought the following beverages: [wine, beer, rum, apple-juice, cachaca] All these beverages have different alcohol content, and they can be compared like this. beer cachaça; apple-juice beer; rum martini; apple-juice rum; beer rum; wine martini; beer wine; wine cachaca In this sequence, beer cachaca means cachaca has more alcohol than beer. He will start drinking beverages with low alcohol content, like beer, and then will move to a beverage containing more alcohol, like wine, and drink all the beverages. He also follows a pattern that he will not drink the same beverage multiple times. If there are multiple options while picking a beverage, Dilbert will pick the drink chronologically, i.e., beverage name start with A will get the maximum priority while beverage name start with Z, will get the minimum priority. Determine the serial of all the beverages that Dilbert drinks. **Beer, apple-juice, rum, wine, cachaca, martini.**

**Question 4 (3+10+10 = 23 Points):** Let there is an undirected graph with 10 nodes with the following edges (x-y means x and y are connected): 1-4, 1-2, 2-3, 2-8, 2-5, 2-7, 3-9, 3-10, 4-3, 5-6, 5-7, 5-8, 8-7. Now,

1. Express these relations as a graph.   
   Diagram

   Description automatically generated
2. II. Apply BFS considering 1 as the source node (level-0 node). Draw the BFS tree and mark each level. If there are multiple options at any step, pick the node with smaller index.

A piece of paper with writing on it

Description automatically generated with medium confidence

1. III. Repeat part II considering 6 as the source node (level-0 node).

Diagram

Description automatically generated

**Question 5 (13 Points):** Consider the following directed graph. Here 1->5 denotes 1 is a prerequisite of 5. Apply DFS and find a feasible jobDiagram

Description automatically generated schedule. You must show the start/finish time of each node.

**Question 6 (30 Points):** Agree or disagree the following statements. First, clearly mention if you agree or disagree. Then, use an example to justify your claim.

1. BFS does not work for weighted graph. **True, BFS can still work on a weighted graph however it might not find the shortest and most efficient path.**
2. II. While implementing BFS, we plan to use a stack instead of queue. It will still work if the distance of any node from the source is 1. **False, the queue is the correct data structure to use because a queue uses a first-in-first-out operation. Using a stack, the output would not be correct.**
3. III. A graph is also a tree. **False. Every tree is a graph, but not every graph can be a tree.**
4. IV. In a tree there exists only one route between any two vertices. **True. A tree cannot have any cycles, so there can only be one path between two vertices.**
5. V. If we have a graph with N nodes, it must contains at least (N-1) edges. **True, (N-1) is the minimum amount of edges. If there are any less, then the graph will not be connected.**