COMP261
Algorithms and Data Structures
2024 Tri 1

Test 3
What could be asked

Types of Questions

- True / False
- Multi-choice
- Short answer
- Writing Java Code for a given task

Network flows – What you need to know

- Constraints on a network flow graph: Capacity constraint and balance constraint.
  - What are they?
  - You could be given a flow graph and asked if it satisfies the constraints

- Ford-Fulkerson method : Augmentation paths, Residual graph, Bottlenecks
  - How it works?
  - Given a graph follow steps of Edmond karp algorithm to:

    find augmentation paths and the associated flow.

    At a given step, what will be the contents of a different data structures used: residual graph, map of back-pointers etc.

- (Pseudo-code of the algorithm will be provided – follow the pseudo-code to answer the question; pseudo-code may not be complete – e.g. "update residual graph" – you must know how the algorithm works.)

- Write Java code to accomplish a given task

Centrality – What you need to know

- Given a problem scenario, which of the different centrality measures will be most useful and why?

- Given a problem scenario, compare the use of different centrality measures

- Show steps of PageRank on a given graph (Pseudo code will be given – follow the pseudo-code to answer the question)

Cycles and Spanning Trees – What you need to know

- Trace the steps of DFS based cycle detection

- Trace the steps of cycle detection using disjoint sets

- Trace the steps of Prim's algorithm

- Trace the steps of Kruskal's algorithm

- Given a forest, perform Union and find operations

- Write Java code to accomplish a given task for cycle detection/finding a spanning tree/Union and Find operations in a forest

General – What you need to know

- Given a problem scenario that can modelled using graphs which category of graph problems would it belong to:
  - Graph query
  - Graph algorithm
  - Graph analytics

- Analytical questions
  - Why we need a given step in the algorithm – Edmond karp / Page rank / Prim's / Kruskal's etc.
  - What if we modify the algorithm in a given way?
  - What if we had a specific type of a graph as input
  - etc.