**Unit 3 Algorithmics**

**Submit Task – Week 4**

Graph ADTs

1. Describe how you could model a social network where people connect by accepting each other as friends (think Facebook.)

* In this scenario a social network can be modelled with a normal Graph ADT where each person is represented by a node and connections are represented as edges. It’d be undirected unlike the scenario below as friendship is mutual. Metadata (cause dear Meta loves to harvest data) like strength of connection, date when the friendship was established could be stores as attributes of the edges or nodes.

1. How does this change if, instead, people follow other people to see what they post? (this Instagram/Twitter).

* For stuff like Insta and twitter, it’d have to be a directed graph as people don’t necessarily have to follow one another mutually to view their content and interact with them.

1. How might we use a graph to model a complex series of tasks which must be completed, with some tasks requiring others to be completed first?

* A DAG (directed acyclic graph) can be used as each task is represented as a node, and the directed edges show the dependencies. This ensures all tasks are completed in order, one after another.

1. A region is modelled such that edges represent roads and nodes represent towns. A road maintenance company inspects every road by driving across it, covering each road exactly once. What is the algorithmic name for this? (And, for bonus points, what must be true about the network for this to be possible?)

* Euler Path or Euler Circuit can be used to accomplish this, and can only be used when the graph is connected and each node has an even degree except for when there are 2 nodes with odd degrees where one of them can serve as tge start point and the other can serve as the end point.

1. Can every undirected graph be represented as a directed graph? And vice versa?

* Nope, not every undirected graph can be represented as a directed graph, and vice versa. For example, a directed graph can represent asymmetrical relationships (such as A follows B, but B doesn't necessarily follow A), whereas undirected graphs cannot.

1. Does a minimum spanning tree have to contain every edge that has the minimum weight of edges in that graph?

* No, a minimum spanning tree (MST) does not have to contain every edge that has minimum weight in that graph. An MST is a subset of the edges of the graph that connects all the vertices together without any cycles and with the minimum possible total edge weight. It may exclude some edges with the same weight.

1. Can you add an edge to a spanning tree so that it is still a spanning tree?

Yeah as long as this edge doesn’t form cycles with existing edges in the tree and connects all verts in the graph

Make sure you explain your answers.

Python Practice

Use Python to create a small network with five nodes and some edges with weights. (Choose your own scenario – be creative.) Display the output using matplotlib.

Done in file u3w4-1.py