

CptS 223 Homework #4 - Graphs

Please complete the 'homework problems on the following page using a separate piece of paper. Note that this is an individual assignment and all work must be your own. Be sure to show your work when appropriate.

1. [13] Define these terms as they relate to graph and graph algorithms:
Use mathematical terms where appropriate.

Graph

$G = (V, E)$ consists of a set of vertices, V , and a set of edges, E .

Vertice

A vertex is a node in a graph with adjacent nodes

Edge

An edge is the path between two vertices

Undirected Graph

A graph with edges that go in both directions

Directed Graph

A graph with one direction edges

Path

The walk from one vertex to another, through edges and vertices

Loop

When an edge points to its original vertex

Cycle

When a path starts and ends at the same vertex

Acyclic

a graph w/o cycles

Connected

A spanning graph

Sparse

Number of Edges \leq Number of vertices

Weight

The weight of the path from one vertex to another through an edge

2. [4] Under what circumstances would we want to use an adjacency matrix instead of an adjacency list to store our graph?

When space is needed because a matrix has a space complexity is $|V|^2$

3. [6] Name three problems or situations where a graph would be a good data structure to use:

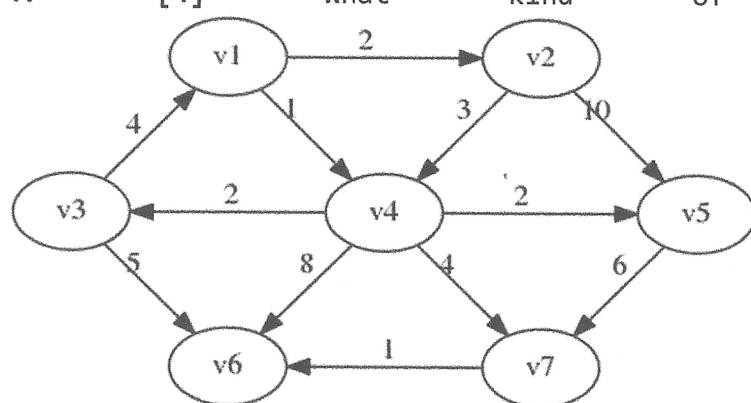
Mapping, Networking, and when looking for the relation between two objects

4.

[4]

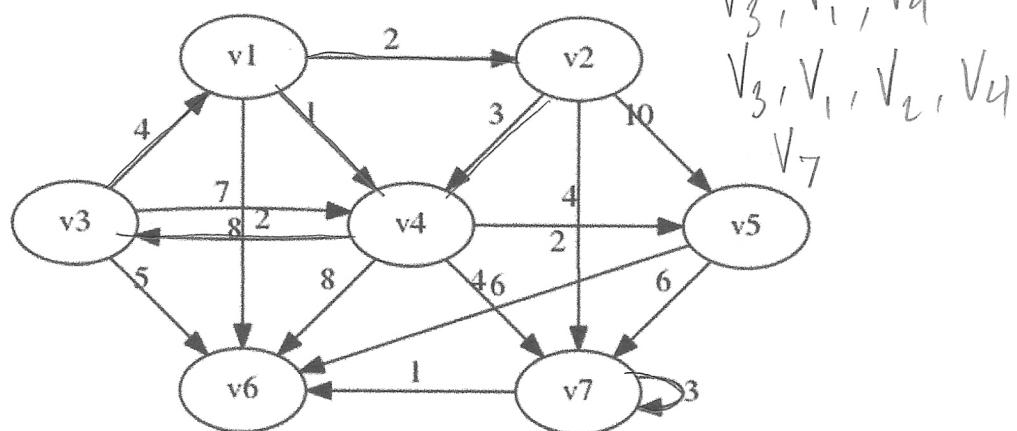
What kind of

graph is this?

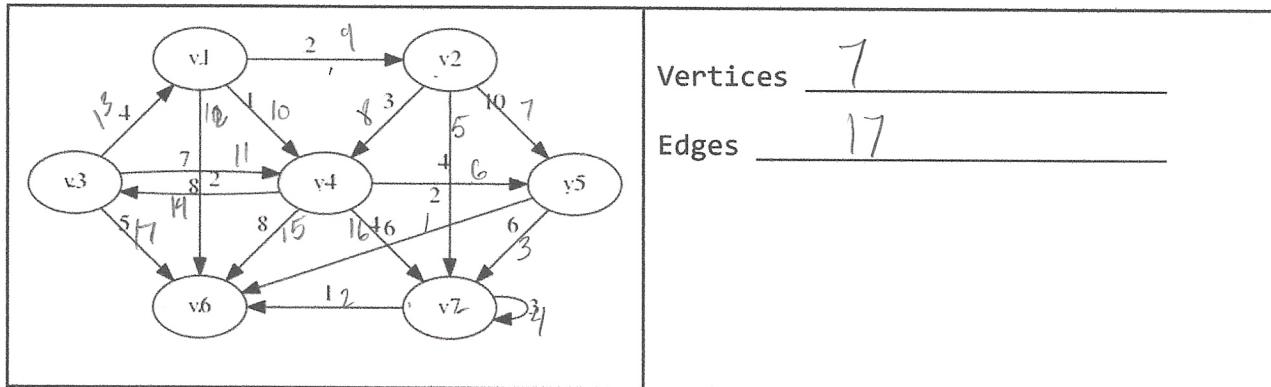


Directed, connected, cyclic graph
Also has weights

5. [4] Identify the loop in this graph:



6. [4] How many vertices and edges are in this graph:



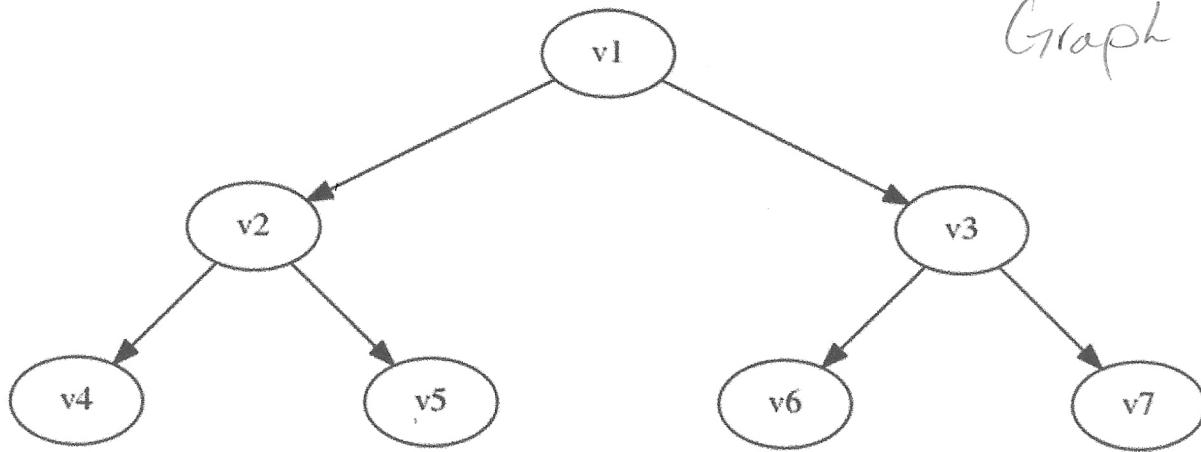
7. [6] Are these cyclic or acyclic graphs?

	Cyclic? Yes <input checked="" type="radio"/> No <input type="radio"/>
	Cyclic? Yes <input checked="" type="radio"/> No <input type="radio"/>
	Cyclic? Yes <input checked="" type="radio"/> No <input type="radio"/>

8. [5] A tree is a particular kind of graph. What kind of graph is that?

Directed, Acyclic Graph

Directed, Acyclic
Graph

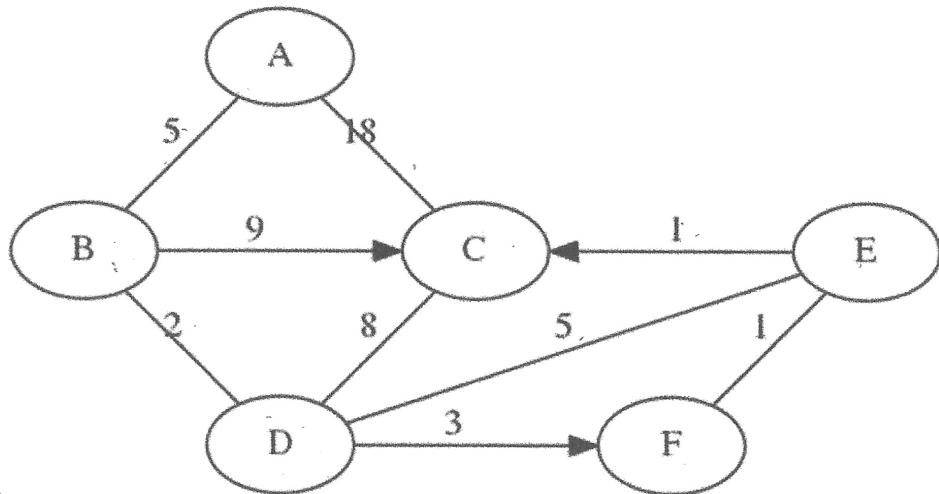


9. [4] What is the difference between a breadth-first search and a depth first search?

Breadth-first is a top down traversal
while Depth first is a bottom up traversal.
Depth uses recursion while Breadth
uses a queue.

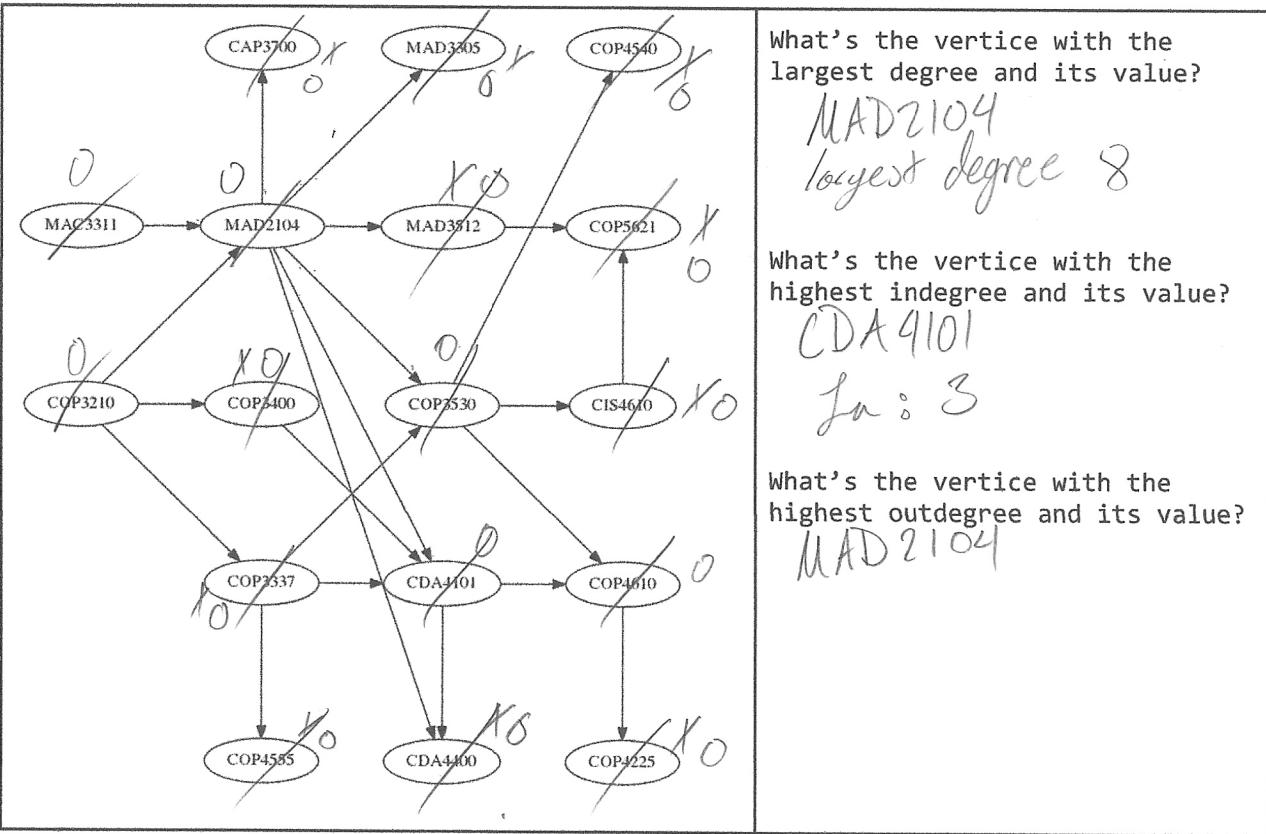
10. [10] Dijkstra's Algorithm. Use Dijkstra's Algorithm to determine the shortest path starting at A. Note that edges without heads are bi-directional. To save time, you do not have to add items to the "priority queue" column after it has been discovered (listed in the "distance" column). Use the table below to show your work.

What's the shortest route (by weight) from A to C?



Node: Distance	Priority Queue
A: 0	A 0
B: 5	B 5 C 18
D: 7	B 5 D 7 C 14
F: 10	D 7 C 15 E 12 F 10
E: 11	F 10 E 11
C: 12	E 10 C 12

11. [10] Topo sort. Show the final output of running Topo Sort on this graph:



Topo sort output:

Mac3311, COP3210, MAD2104, COP3400, COP3337,
COP4555, CAP3100, MAD3305, MAD3512, COP3530,
CDA4101, CDA4400, COP4610, CIS4610, COP4540,
COP5621, COP4225