Exam 3 key

A.) 1) i: Pre-order → ~~n k c b l m t p r o u~~ (swap)
ii: In-order → b c k l m n o p r t u
3.) iii: Post-order → b, c, m, l, k, o, r, p, u, t, n

2.) Mistake is in preorder, it should be n, K, c, b, l, m, t, p, o, r, u

4.) the in-order traversal is in alphabetical order.

B. You want to store 374 distinct names in a binary search tree (BST):

1. (3 pts) What's the maximum depth possible, and how is such a BST created?
2. (4 pts) What's the minimum depth possible, and how is such a BST created?
3. (3 pts) Assume we create a minimum-depth BST. What's the greatest number of comparisons possible when conducting a binary tree search, in the worst-case?

d = 373 – submit ordered

d = 9 — order list, then recursively submit middle elements of sub lists.

Smallest d

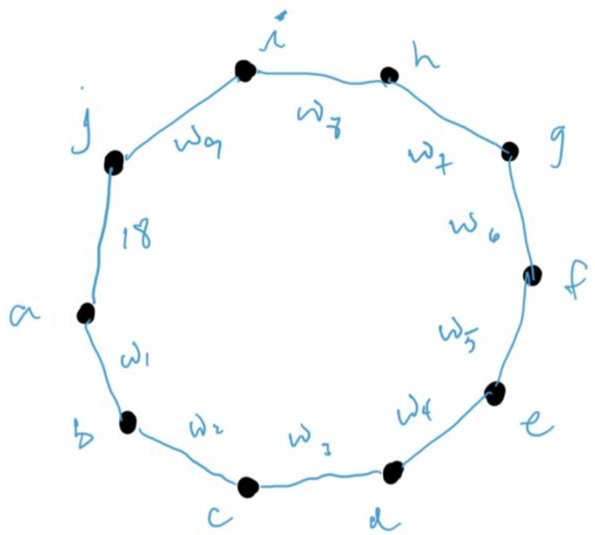
$2^d - 1 > 374$; $d = 9$ → 10 comparisons in worst case

C.) 1. A is planer, by looking at the degree of the nodes. No way to make
2. B is not planer b/c it contains ~~$K_{3,3}$~~ K_5 or $K_{3,3}$

D) 1) This will likely be best plotted on an adjacency matrix because there are (relatively) few countries, and most countries have a lot of diplomatic relations.
2) This will be best plotted as an adjacency list because there are thousands of cities with few or no air routes.

E) 1) n, k, c, b, l, m, t, p, o, r, u this is preorder traversal
2) n, k, t, c, l, p, u, b, m, o, r

F. Given this positively weighted graph:



note: 8, not 9

1. $\sum_{i=1}^{8} w_i < 18$

2. Distance is the sum of the weights between a + the node.

E.g. $D(e) = \sum_{i=1}^{4} w$

Suppose we want to find the shortest path from node a to node j, and we use Dijkstra's algorithm. The distance between a and j is 18. If j is the last node settled,

1. what do we know about the distances w_i?
2. what is the distance between a and each node?

$D(j) = \min(18, \sum_{i=1}^{9} w_i)$, in particular.

G

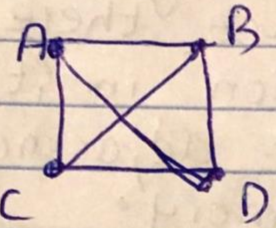
1: the number of distinctly different friendship is the number of arch in the completed graph. The friendship between A and B is the same as the friendship between B and A.

4 nodes, completed graph → each nodes has 3 edges ⇒ 12 edges.
Each 2 edges represent 1 arc ⇒ 6 arcs
⇒ Total of 6 friendships

2: The number of different sets of friendship is power set of the set of all friendships, which has 6 cardinals

⇒ There are 2^6 cardinals in the powerset, or 2^6 different configuration of friendship betwen 4 people.

G) Soln



1) Six Friendship are possible betn them.

2) we can calculate distinct different Facebooks by using power set.
$2^6 = 64$ possible Facebooks.

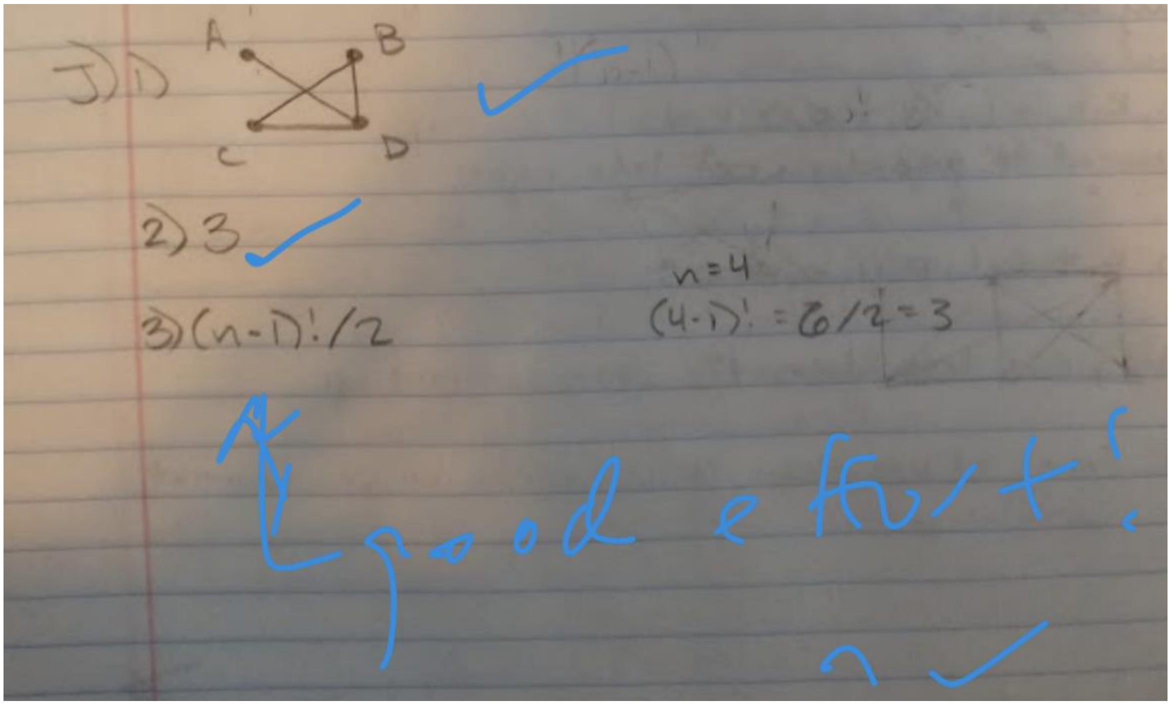
H.

1. 21! hamiltonian circuits
2. No because all the nodes would have an odd degree. Euler Path must have 0 nodes or 2 nodes with odd degrees.

I) 1) { } can't be associated with a unique number

2) $2^{10} - 1$ (for the empty set) different numbers

3) All the integers with distinct digits in decreasing order from 0 to 9876543210.



Part 3: these graphs are complete graphs of order (n-1) with a vertex of degree 1 tacked on. Sophia's is not the correct answer, but it's my bad: I didn't cover this example this semester, so you probably wouldn't have known or seen the formula (n^(n-2) for a complete graph of n vertices). So what I looked for especially was a good guess, and a check that a proposed formula worked for the case of 4 vertices (the case we had here). On that count, Sophia did great!