**After lecture21 & lecture22 & lecture23**

Practice Problems (all taken from previous exams)

1. The number of trees in a binomial heap with n nodes is

a) logn

b) n

c) nlogn

d) n/2

2. Which two fibonacci heap functions have the same complexity?

a) Insertion, Union

b) Insertion, Deletion

c) extract\_min, insertion

d) Union, delete

3. If |V| is the total number of elements, in the worst case, how many leader pointer updates are needed when fusing two groups in the union method: A. O(1)

B. O(log|V|)

C. O(|V|)

D. O(|V|^2)

4. Consider the following program:

for i from 1 to 12:

MakeSet(i)

Union(2,10)

Union(7,5)

Union(6,1)

Union(3,4)

Union(5,11)

Union(7,8)

Union(7,3)

Union(2,12)

Union(9,6)

Print(Find(6))

Print(Find(3))

Print(Find(11))

Print(Find(9))

Assume the disjoint set data structure is implemented so after a union, the smallest valued element in the set is the label on the set. What is the output?

a) 6 3 11 9

b) 3 1 1 3

c) 1 3 3 1

d) 9 11 11 9

5. Show the Fibonacci heap that results from calling FIB-HEAP-EXTRACT-MIN on the Fibonacci heap shownA diagram of a number tree

Description automatically generated

6. We have students 1, 2, …, n who need to be assigned to dormitories at a university that has an arbitrarily large number of dorms. There are “m” same dormitory requests (s1,t1), (s2,t2), …,(sm,tm) meaning students si and ti must be assigned to the same dorm. There are also “k” different dormitory requests (u1,v1), (u2,v2),…,(uk,vk) meaning students ui and vi must be assigned to different dorms. Give an algorithm using the union-find data structure to determine whether it is possible to assign students to dorms so that all constraints are satisfied.