

# COP 5536

## Advanced Data Structures Spring 2021

### Exam 2

### CLOSED BOOK

**9:00 am – 10:30 am**

(60 Minutes + Extra 30 Minutes for scanning & submission)

**PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY**

1. For all problems, use only the algorithms discussed in class/text.
2. Write your answers directly on your own white blank paper. You may use extra scratch paper for calculation, but these will not be submitted.
3. All answers will be graded on correctness, efficiency, clarity, elegance and other normal criteria that determine quality.
4. You may use only a pen or a pencil. No calculators allowed.

**Note.** All answers will be graded on correctness, efficiency, clarity, elegance and other normal criteria that determine quality. The points assigned to each question are provided in parentheses.

Last Name: \_\_\_\_\_

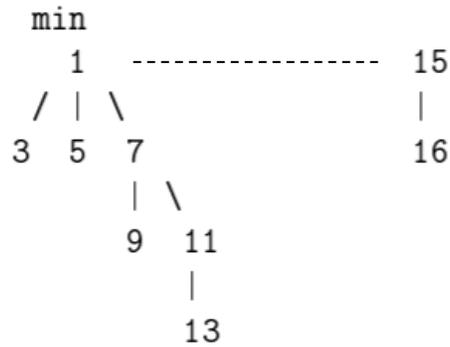
First Name: \_\_\_\_\_

UFID: \_\_\_\_\_

Q. 1 (10)	Q. 2 (12)	Q. 3 (14)	Q. 4 (14)	Total (50)

Question 1 (10):

For the following min Fibonacci heap, assume that the *ChildCut* field of all nodes is TRUE.



- (a) (4) Perform *DecreaseKey* operation by changing 11 to 2. Show the result.
- (b) (6) Perform *DeleteMin* operation on the resulting Fibonacci heap from (a), clearly label the *ChildCut* value. Show the result.

Question 2 (12):

Start with an empty two-pass **MIN** pairing heap,

- (a). (6) Insert the following sequence of keys: 35, 48, 24, 52, 13, 54, 60, 55, 19. Show the pairing heap after each insert.
- (b). (6) Perform a *RemoveMin* operation on the resultant min heap from (a). Show steps.

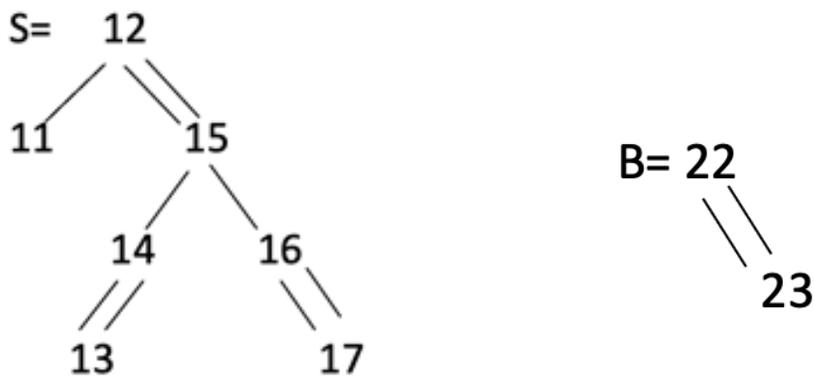
Question 3 (14):

Start with an empty AVL tree and perform insert operations using the following sequence of keys: 19, 23, 28, 26, 24, 25, and 20.

**Show each step and degree at each step.**

Question 4 (14):

For the following red-black trees (double links are red links),



- (a). (7) Consider the red-black tree above. Perform delete (14) operation for red-black tree S, showing each step.
- (b). (7) Perform Join (S; 20; B) on the **ORIGINAL** red-black trees in the above figure, showing each step