

# CS4311 DESIGN AND ANALYSIS OF ALGORITHMS

## Homework 6 (Suggested Solution)

1. **Ans.**

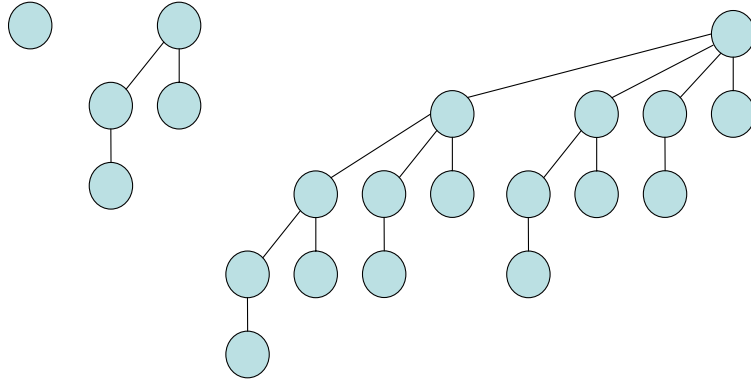


Figure 1: Binomial heaps with 21 nodes.

2. **Ans.** For this question, there are various correct answers. Figures 2 to 6 show one possible sequence of the change in the Fibonacci heaps after the five required operations.

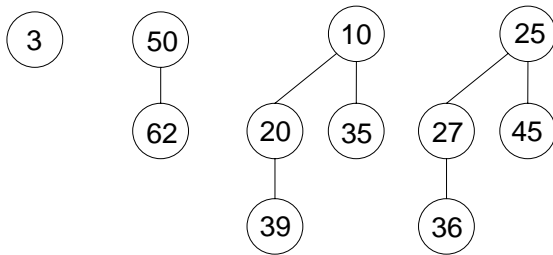


Figure 2: After Decrease-Key 55 to 3.

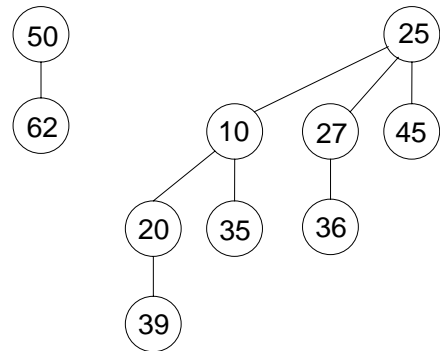


Figure 3: After Extract-Min.

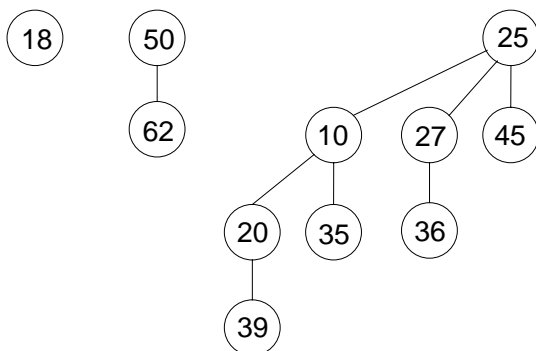


Figure 4: After Insert 18.

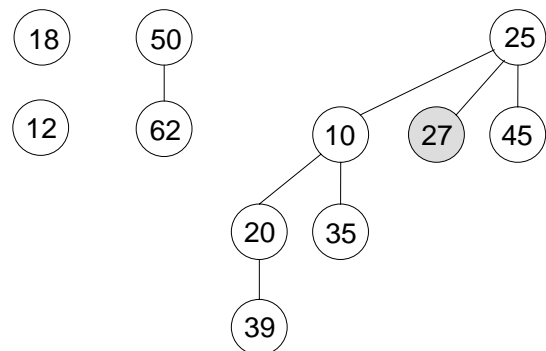


Figure 5: After Decrease-Key 36 to 12.

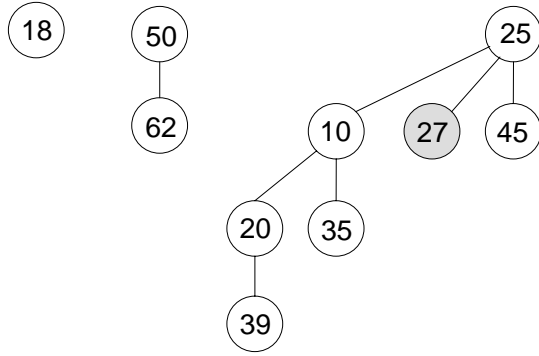


Figure 6: After Extract-Min.

3. (a) Ans.

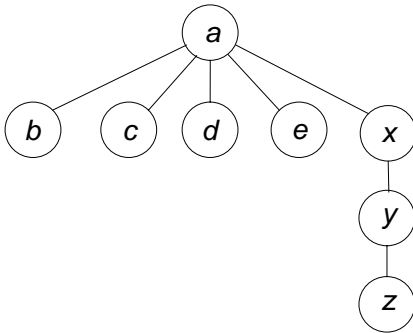


Figure 7: After Union( $a, x$ ).

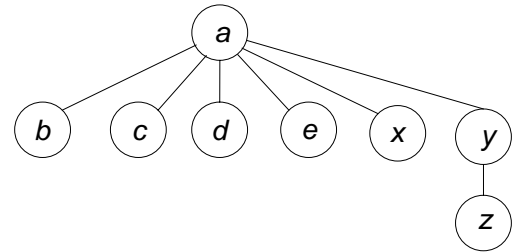


Figure 8: After Find( $y$ ).

(b) Ans.

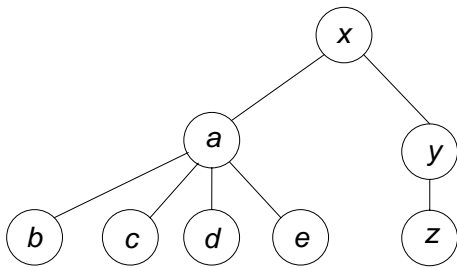


Figure 9: After Union( $a, x$ ).

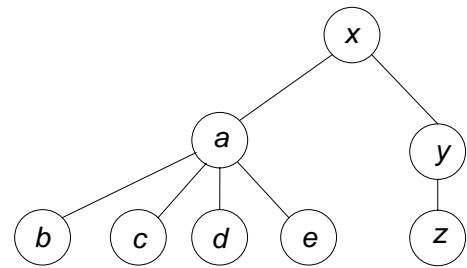


Figure 10: After Find( $y$ ).