Name: Dinh Nguyen

CS 260

Assignment 13

Question 1

1. Index of the parent of the value at index 7 is 3
2. Index of the parent of the value at index 8 is 3
3. Index of the left child of the value at index 4 is 9
4. Index of the right child of the value at index 4 is 10
5. Tree:

Null

Null

Null

Null

Null

Null

Null

Null

Question 2

a)

Null

Null

Null

Null

Null

Null

Null

b)

Null

Null

Null

Null

Null

Null

Null

c)

Null

Null

Null

Null

Null

Null

Null

Question 3

1. Array after insert 6:

|  |  |
| --- | --- |
| Index | 0 |
| Value | 6 |

1. Array after insert 9:

|  |  |  |
| --- | --- | --- |
| Index | 0 | 1 |
| Value | 6 | 9 |

1. Array after insert 4:

|  |  |  |  |
| --- | --- | --- | --- |
| Index | 0 | 1 | 2 |
| Value | 4 | 9 | 6 |

1. Array after insert 8:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 |
| Value | 4 | 8 | 6 | 9 |

1. Array after insert 7:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 | 4 |
| Value | 4 | 7 | 6 | 9 | 8 |

1. Array after insert 2:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 | 4 | 5 |
| Value | 2 | 7 | 4 | 9 | 8 | 6 |

Question 4

1. Array after the first downheap swap

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 | 4 | 5 |
| Value | 5 | 9 | 8 | 12 | 10 | 6 |

1. Array after the second

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 | 4 | 5 |
| Value | 5 | 9 | 6 | 12 | 10 | 8 |

Question 5

1. Array after delete 2 and complete all downheap swaps.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 | 4 |
| Value | 4 | 7 | 6 | 9 | 8 |

1. Array after delete 4 and complete all downheap swaps

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 |
| Value | 6 | 7 | 8 | 9 |

1. Array after delete 6 and complete all downheap swaps

|  |  |  |  |
| --- | --- | --- | --- |
| Index | 0 | 1 | 2 |
| Value | 7 | 9 | 8 |

1. Array after delete 7 and complete all downheap swaps

|  |  |  |
| --- | --- | --- |
| Index | 0 | 1 |
| Value | 8 | 9 |

1. Array after delete 8 and complete all downheap swaps

|  |  |
| --- | --- |
| Index | 0 |
| Value | 9 |

1. Last value left in the array is 9

Question 6

1. 4 nodes in the graph: A, B, C, D
2. All edges in the graph: (A,B) (A,C) (B,C) (B,D) (C, D)
3. 2 different paths from A to D: (A,C,D) or (A,B,D)
4. Cycle starting at node D: (D,C,B,D)

Question 7

1. Diagonal of the matrix contains 1s because it represent an edge of a node connected to itself.
2. Adjacency Matrix

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | B | C | D |
| A | 1 | 1 | 0 | 0 |
| B | 1 | 1 | 0 | 1 |
| C | 0 | 0 | 1 | 1 |
| D | 0 | 1 | 1 | 1 |

1. Graph for Adjacency Matrix, nodes: A,B,C,D. Edges: (A,C) (A,D) (B,D)

Question 8

1. Adjacency Matrix for the graph

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | B | C | D |
| A | 0 | ∞ | 2 | ∞ |
| B | ∞ | 0 | 4 | 3 |
| C | ∞ | ∞ | 0 | 1 |
| D | 6 | ∞ | ∞ | 0 |

1. Draw graph for the matrix

2

6

1

1

5

4

Question 9

1. Adjacency List of the Graph

|  |  |
| --- | --- |
| A | B |
| B | A, D |
| C | D |
| D | B, C |

1. Adjacency List of the Graph

|  |  |
| --- | --- |
| A | (C,2) |
| B | (C,4), (D,3) |
| C | (D,1) |
| D | (A,6) |

Question 10

1. Shortest path from A to F is (A,B,F) with total weight is 2+1=3
2. Shortest path from A to D is (A,B,F,G,D) with the total weight is 2+1+4+2=9
3. Two subsets of nodes that makes SCC are: (A,B,E) and (D,F,G)