CSCI A594 Data Structures

Practice Problems

_____**1.** Which of the following is *the most likely* application for queues?

a. a database
b. a sorting algorithm
c. a web server
d. a linked list

_____**2**. Which of the following functions will give you the *worst* execution time as the big O of an algorithm?

a. exponential
b. logarithmic
c. linear
d. quadratic

_____**3.** For a linked list implementation of a queue, which is the easiest and most efficient implementation of the enqueue and dequeue operations?

a. enqueue at the front and dequeue from the back of the list
b. enqueue at the front and dequeue from the front
c. enqueue at the back and dequeue from the front
d. enqueue at the back and dequeue from the back

_____**4.** Which of the following functions is *not* $O(n^2)$?

a. $6\ n \log_2 n$ -+ 7
b. $3\ n^2 - 2\ n + 5$
c. $(n^3 - 1) / (n + 1)$
d. $0.3\ n^5 - 2\ n^2 + 7$

_____**5.** Which of the following is the *least efficient* implementation of a table?

a. a hash table
b. an AVL tree
c. a sorted array
d. a linked list

6. Give an example of a hashing function for an integer value, returning a value between 0 and capacity-1.

```
int hash(int key, int capacity)
{
```

7. What is the definition of a Binary Search Tree? Give an example.

8. What is a perfect binary tree? Give an example.

9. What is the maximum number of edges in a graph with *n* vertices?

10. Which algorithm can find the least costly path in a weighted graph from an origin vertex to a destination vertex?

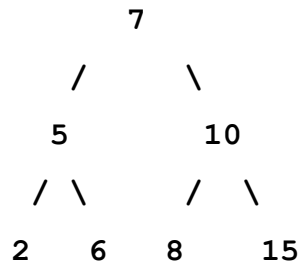
Answers

1. C **2.** A **3.** C **4.** D **5.** D

6.

```
int hash(int key, int capacity)
{
    return (key*37) % capacity;
}
```

7. A Binary Search Tree is a binary tree where for every node, all the nodes in the left subtree have values less than it, and all the nodes in the right subtree have values larger than it. The tree below is an example.



8. A perfect binary tree is one where all the levels have the maximum number of nodes. The tree above is also an example.

9. For a directed graph with n nodes, the maximum number of edges is $n(n\text{-}1)$. For an undirected graph, it is $n(n\text{-}1)/2$.

10. Dijkstra's algorithm.