

University of Nevada, Las Vegas Computer Science 477/677 Fall 2024

Assignment 4: Due Saturday October 12, 2024

Wed Oct 9 05:43:24 PM PDT 2024

Name: _____

You are permitted to work in groups, get help from others, read books, and use the internet.

To turn in the homework, follow instructions given by the graduate assistant, Sepideh Farivar. at farivar@unlv.nevada.edu.

1. Name three kinds of priority queue.

2. Solve the following recurrences.

(a) $F(n) = F(n - 1) + \log n$

(b) $F(n) = F(n - \log n) + \log n$

(c) $F(n) = 2F(n/5) + \sqrt{n}$

(d) $F(n) = 3F(n/9) + 1$

(e) $F(n) = 2F(n - 1) + 1$

(f) Up to now, no student has correctly analyzed this next recurrence.

$$F(n) = F(n - 1) + F(n/2) + 1$$

3. Write pseudocode for the Floyd-Warshall algorithm. Let the vertices be named by integers 1 through n . Let $W[i, j]$ be the weight of the arc from i to j , ∞ if there is no such arc. The output should consist of two arrays,

(a) $V[i, j]$, the weight of the least weight path from i to j .

(b) $\text{BACK}[i, j]$, the back pointer of that path.

4. Write pseudocode for the Bellman-Ford algorithm. Let the vertices be named by integers 0 through n , where 0 is the source vertex. Let $W[i, j]$ be the weight of the arc from i to j , ∞ if there is no such arc. The output should consist of two arrays,
- (a) $V[i]$, the weight of the least weight path from 0 to i .
 - (b) $BACK[i]$, the back pointer of that path.

Your code should include the shortcut to end computation when the solution is complete.

5. What is the asymptotic time complexity, in terms of n , of this recursive C++ function? Can you analyze it using a recurrence? (Yes, you can.)

```
int george(int n)
// input condition: n >= 0
{
    if(n == 0) return 0;
    else return george(n/2)+george((n-1)/2)+n;
}
```

6. The following problem is called a “coin-row” problem. Given a row of coins of various values, select the set of coins of maximum value, subject to the rule that you may not select any two adjacent coins. For example, if the values are 1,5,8,6,1,2,7,3 the maximum is achieved by selecting the coins worth 5, 6, and 7.

Write a C++ program which solves this problem for an arbitrary sequence of values. You may assume that the values are already given. The only part of the program you need to write is the function which computes the best set of coins to select. Miss Farivar will give you more precise instructions if needed.

Turning it in. Let the input be an array of integers, `int A[N]`. You must turn the program in in such a way that Miss Farivar can run it without having to retype your whole program. Thus, it mustn't be a photograph or a pdf file and will be separate from your other work on this assignment.