

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

Assignment 2: Due Friday September 13, 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. In an application, items of a priority queue represent _____ .

2. **pop** and **push** are operators of the ADT _____

3. **enqueue** and **dequeue** are operators of the ADT _____

4. **fetch** and **store** are operators of the ADT _____

5. What is the asymptotic time complexity, in terms of n , of this code fragment?

```
for(int i = 1; i < n; i = 2*i)
    cout << "Hello, world!" << endl;
```

6. What is the asymptotic time complexity, in terms of n , of this code fragment?

```
for(int i = 1; i < n; i++)
    for(int j = i; j < n; j = 2*j)
        cout << "Hello, world!" << endl;
```

7. What is the asymptotic time complexity, in terms of n , of this code fragment?

```
for(int i = 0; m < n; i++)
    m = m+i;
```

8. The following code sorts an array $A[N]$. What is the algorithm used? the possible answers are bubblesort, selection sort, and insertion sort. Assume that “ $\text{swap}(x,y)$ ” exchanges the values of x and y .

```
for(int i = 0; i < N; i++)
    for(int j = i+1; j < N; j++)
        if(A[j] < A[i]) swap(A[i],A[j]);
```

9. The C++ code below implements a function, “mystery.” What does it compute? Assume that n is positive.

```
float mystery(float x, int n)
{
    float y = x;
    float z = 1.0;
    int m = n;
    while(m > 0)
    {
        if(m%2) // that means m is odd
            z = z*y;
        y = y*y;
        m = m/2;
    }
    return z;
}
```

The following C++ code takes as input a non-negative number n .

```
int n;
cout << "Enter a non-negative integer." << endl;
cin >> n;
assert(n >= 0);
int m = 0;
// loop invariant holds here
while(n > 0)
{
    // loop invariant holds here
    m = m+2;
    // loop invariant does NOT hold here
    n = n-1;
    // loop invariant holds here
}
// loop invariant holds here
cout << "The answer is " << m << endl;
```

- (a) What is the purpose of the code?
(b) What is the loop invariant of the loop?