

University of Nevada, Las Vegas Computer Science 477/677 Spring 2023

Study Guide for Examination March 8, 2023

1. Review answers to homework3:

<http://web.cs.unlv.edu/larmore/Courses/CSC477/S23/Assignments/hw3ans.pdf>

2. Review answers to homework4:

<http://web.cs.unlv.edu/larmore/Courses/CSC477/S23/Assignments/hw4ans.pdf>

3. Use Huffman's algorithm to find an optimal prefix-free binary code for the following weighted alphabet.

A	2
B	3
C	7
D	4
E	8
F	15

4. Solve each recurrence using the anti-derivative method.

(i) $F(n) = F(n - 2) + \frac{1}{n}$

(ii) $F(n) = F(n - \sqrt{n}) + 1$

(iii) $F(n) = F(n - \log n) + \log^2 n$

5. Solve each recurrence using the master theorem.

(iv) $F(n) = 2\sqrt{n} + \log n$ (Use substitution.)

(v) $F(n) = 3F(n/2) + 1$

(vi) $F(n) = 4F(n/2) + n^2$

6. Solve each recurrence using the generalized master theorem.

(vii) $F(n) = 3F(n/3) + 3F(2n/3) + n$

(viii) $F(n) = 3F(n/3) + 3F(2n/3) + n^2$

(ix) $F(n) = 3F(n/3) + 3F(2n/3) + n^3$

(x) $F(n) = 3F(n/3) + 3F(2n/3) + n^4$

7. Consider the following recursive program for a function F .

```
int F(int n)
{
    if(n <= 3) return n;
    else return (F(n/2)+F((n+1)/2)+F((n+2)/2)+F((n+3)/2)+n*n)%8191;
}
```

(The purpose of %8191 is to prevent the integers from exceeding the capacity of a standard desktop computer.)

Suppose you wish to find the value of $F(n)$ for some fixed positive integer n . Give asymptotic answers to the following questions.

- (a) What is the time complexity of your calculation if you use the recursive code given above?
- (b) What is the time complexity of your calculation if you use dynamic programming?
- (c) What is the time complexity of your calculation if you use memoization?

8. Solve the recurrence: $F(n) = F(\log n) + 1$