

Computer Science Notes

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Zach Leach

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The University of Texas at Dallas

Contents

I	Computer Networks	3
1	Exam 1	5
II	Advanced Algorithms	7
1	Exam 1	9
2	Assignment 1	11
3	Assignment 2	13
3.1	Problem 1	13
3.2	Problem 2	13
3.3	Problem 3	13
3.4	Problem 4	13
3.5	Problem 5	13
3.6	Problem 6	13
III	Software Engineering	15
1	Exam 1	17
IV	Operating Systems	19
1	Exam 1	21

Preface

These are my exam review notes taken throughout the Spring semester.

February 5, 2024

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Part I

Computer Networks

Exam 1

Part II

Advanced Algorithms

Exam 1

Assignment 1

Assignment 2

3.1 Are either $\lceil \lg n \rceil!$ or $\lceil \lg \lg n \rceil!$ polynomially bounded?

Polynomially bounded means $f_n = O(n^k)$ for some constant k . Therefore, to demonstrate whether f_n is polynomially bounded, prove or disprove the inequality $f_n \leq c \cdot n^k$.

3.2 Use induction to prove $F_i = \frac{\phi^i - \hat{\phi}^i}{\sqrt{5}}$; where $F_i = F_{i-2} + F_{i-1}$, and ϕ is the golden ratio $\frac{1+\sqrt{5}}{2}$.

3.3 Show that $k \lg k = \Theta(n)$ implies $k = \Theta\left(\frac{n}{n \ln n}\right)$.

3.4 Are either 2^{n+1} or 2^{2n} big- O of 2^n ?

3.5 For each pair of functions (A, B) , indicate whether A is O, o, Ω, ω , or Θ of B . Assume $k \geq 1$, $\epsilon > 0$, $c > 1$ are constants.

A	B	O	o	Ω	ω	Θ
$\lg^k n$	n^ϵ	yes	yes	yes	yes	yes
n^k	c^n	yes	yes	yes	yes	yes
\sqrt{n}	$n^{\sin n}$	yes	yes	yes	yes	yes
2^n	$2^{n/2}$	yes	yes	yes	yes	yes
$n^{\lg c}$	$c^{\lg n}$	yes	yes	yes	yes	yes
$\lg(n!)$	$\lg(n^n)$	yes	yes	yes	yes	yes
A	B	yes	yes	yes	yes	yes

3.6 Order the following functions such that $f_1 = \Omega(f_2)$, $f_2 = \Omega(f_3)$, ..., $f_{29} = \Omega(f_{30})$, and partition them into equivalence classes such that each function is big- Θ of each other.

Part III

Software Engineering

Exam 1

Part IV

Operating Systems

Exam 1

