EECS210 **Exam 2 Review Guide** **Fall, 2017**

Administrative

- When: Thursday, November 9, 2017
- Where: In class

Read carefully all of the following items....

- Bring your KUID. *You will not be allowed to take the exam without your KUID.*
- The exam will be closed book and closed notes.
- No calculators, cell phones, head phones, or electronic devices of any sort will be allowed.
- Once you start the exam, you will not be excused from the room for any reason unless you turn in your exam. Once it is turned in, you cannot come back and continue working on it.
- Any unauthorized absence will automatically result in a zero for this exam.

Exam Coverage

You are responsible for all topics covered in our lectures, discussions, reading assignments, practice homework, Connect and Written homework assignments.

Topics Covered

Proof Techniques and their Applications

(1) Given a proposition P, understand the construction of valid argument and be able to use it to establish the validity of propositions.

(2) Understand the different structures of propositions (simple proposition, implication, biconditional, quantifications) and be able to prove, or disprove, the validity of a proposition using various proof techniques.

Relations

(1) Understand the general structure of a (binary) relation defined from a set A to a set B and be able to perform basic operations on relations.

(2) Understand the different representations of a binary relation and be able to construct and describe a binary relation defined from set A to set B.

(3) Understand the general structure of a relation defined on a set A and be able to prove, or disprove, that a given relation is a reflexive, irreflexive, symmetric, asymmetric, antisymmetric, transitive, or an equivalence relation.

(4) Understand the property of set partition and be able to construct partition(s) using the equivalence classes of an equivalence relation defined on a set A.

(5) Understand the structures and properties of closures of a relation and be able to compute the reflexive, symmetric, and transitive closure of a given relation defined on a set A.

(6) Understand the structure of partially-ordered relation, totally-ordered relation, and well-ordered relation defined on a set A and be able to prove, or disprove, that set A is a partially-ordered set, totally-ordered set, or well-ordered set.

Functions

(1) Understand the difference between a function and a relation and be able to prove, or disprove, that a given relation is a function.

(2) Understand the general structure of a function defined from a set A to a set B and be able to perform basic operations on functions.

(3) Understand and be able to prove, or disprove, that a given function is an injection, surjection, or bijection.

(4) Understand the basic structure of an invertible function and be able to compute, and verify, the inverse of an invertible function.

(5) Understand the basic properties and be able to manipulate some commonly encountered functions in computing, including logarithmic function, polynomial function, exponential function, ceiling and floor functions, absolute function, and modular function.

Sequences and Summations

(1) Understand the structures of a finite sequence and be able to apply basic summation techniques in evaluating finite summations.
(2) Understand and be able to apply the technique of telescopic summations in evaluating finite summations.
(3) Understand and be able to evaluate multiple summations.

Complexity of Algorithms

(1) Understand the structures of an algorithm and be able to apply the general technique of summations to set up and compute the complexity function of a given algorithm.
(2) Understand the structures of basic operation(s) and dominating step(s) of an algorithm and be able to use them to evaluate the complexity function of a given algorithm.
(3) Understand the basic structure and the significance of best-case and worst-case complexities of an algorithm and be able to compute these complexity functions in closed form.
(3) Understand the basic structures and properties of asymptotic relations, including big-O, big-Ω, big-Θ, little-o, and little-ω.
(4) Given two functions f(n) and g(n), be able to use the definitions of asymptotic relations to prove, or disprove, any asymptotic relation(s) between these given functions.
(5) Given two functions f(n) and g(n), be able to use the properties of asymptotic relations to prove, or disprove, any asymptotic relation(s) between these given functions.
(6) Understand the application, and limitation, of Limit Ratio Theorem and be able to use it to prove, or disprove, any asymptotic relations between two given functions.
(7) Given two algorithms with complexity $T_1(n)$ and $T_2(n)$ in closed-form, be able to compute a threshold k such that one algorithm outperforms the other whenever $n \geq k$.
(8) Understand the significance and impact of complexity function on the performance of algorithms. Given an algorithm with complexity T(n) in closed-form. If the CPU time required to execute the algorithm with a fixed input size n is given, be able to compute the corresponding CPU time required to execute the same algorithm if the input size is changed to n^*.