ESE112 Final Exam Study Guide

Exam Information

• Thursday, December 17th from 9:00 to 11:00 am in 216 Moore
• Closed book closed notes
• Bring a calculator
• Expect questions from lab material and practice exercises done in class

I. Circuits

• Ohms law (Relationship between V, I, R), Kirchhoff’s Voltage and Current Law
  o Voltage Divider (In general be able to analyze problem using circuit theory)
  o Current flow convention
• Capacitor Basics
  o RC circuit
  o Time constant (tau = RC)
• Know the basics units of Voltage, Resistance, Current, Capacitance, and Power
• Know basic circuit symbols and schematics
• Power

II. BoeBot

• Data type limitations
• I/O pins (which are used for servos)
• Servos pulsewidth
• You do not need to memorize any classes (this will be provided if a question is asked).
• Expect some sort of problem question related to lab activities

III. Java Programming

Basics

• Literals
• Primitive types: int, double, char, boolean
• Non-primitive type: String (note difference between char and String representation)
• Operators: arithmetic, boolean, relation, and assignment operators
  o Operator Precedence – only operators covered
• Expressions: value and type
• Variables: initialization and re-initialization.
  o Regular variable vs. constant (final keyword)
• What is a Statement
• System.out.println(…)
Control Structures
- Loops: While, for, do
- If statements: all three flavors (if by itself, if-else, if-else if)
- Break vs. continue
- Dangling else problem
- When can we not use { } with if or while statements
- Nested if and loop statements

Methods
- Method header: return type and input(s)
- Method body: work the function performs
  - Must finally return something (if not void) using return statement.
- How to call method with a class, outside a class
- For now all methods will be public and static
- Syntax of main method and why we need main

Scope
- Scope of method within method/if/loop block
- Scope of method parameters
- Scope of global variables

Syntax vs. Semantic Errors
- Typical Syntax errors: semicolon, case sensitive statements, variables undefined, return statement errors
- Semantic Problems (encountered after executing the programs): output not behaving as expected (usually order of statements or increments are wrong), infinite loops.

Java program Structure
- Class and filename
- Class for OOP vs. non-OOP programming style
- Import statement
Objects

- How to create objects
- Instance variables
  - scope of an instance variable
    - within the class
    - outside class (public vs. private)
- Methods
  - Query(getters) and Command(setters)
- Constructor
- Difference between static and non-static variables and methods
- Keyword this
- Associativity of Dot Operator

References Type

- Value of reference type
- Null, NullPointerException
- Storage of Reference Type (stack vs. heap)
- What are aliases?
- Comparing reference variables with == vs. equals

Array of Primitives and Objects

- Creating arrays
- Traversing arrays
- ArrayOutOf BoundsException
- Invalid indices

Inheritance

- extends, super, protected keyword
- what can be inherited (protected keyword)
- type rules
- instanceof operator
- overriding: e.g. toString(), equals(), how is it different from overloading?
- abstract classes