

Review for Midterm; Shift Register

Agenda

- Reminder of Midterm: **Thu Feb 9** (this week; samples on web, with caveat)
- Take up any questions from previous lectures
- Review topics for midterm; practice: equivalent resistance for multiple R's
- New material: – Serial-Parallel data conversion (from last lecture's notes)
 - Operation of shift register , ie. 74HC595

Assignment

- Study for midterm test

Arduino Review

Here's a list of resources and topics covered to date. You can use this list to help guide your studying for term test #1.

- General: Arduino language and program structure as seen in lab exercises: setup(), loop(), input, output, digital [digitalRead(), digitalWrite()], analog [analogWrite()]
- Teensy communication methods: keyboard, mouse, serial
- Typical processor speed, RAM, storage capacities and cost (approximate order of magnitude) for the spectrum of embedded & mobile systems
- Identifying storage limitations of embedded / mobile systems especially stack, RAM
- General methodology of reading spec sheets to determine suitable parameters for voltage, current, and other operating limits
- Difference between flash and EEPROM with particular reference to Arduino
- Definitions of analog and digital circuits; understanding of how & why digital circuits tend to be more power-efficient
- Types of components: resistor, capacitor, and inductor; examples of each
- Categorization of components: active vs passive; analog vs digital, linear vs non-linear, sensor vs actuator
- Resistor colour code
- Digital inputs, floating inputs and pull-up resistors
- Series and parallel resistance; Ohm's law; Power formula; formulae for calculating net equivalent resistance; "N" identical resistors in parallel
- Voltage division in a series circuit; calculating individual voltage drops
- Potentiometer: how it functions and is used
- D-to-A in an Arduino system: PWM; examples of everyday systems that use PWM form of control
- Controlling multi-coloured LED , 7-segment displays

List of Labs and summary of techniques

- Lab 1: Basic IDE setup, “Hello World” blinking LED
- Lab 2: Keyboard, mouse, and serial emulation
What are the API calls and capabilities?
- Lab 3: Tri-colour LED; first parallel circuit, current-limiting resistors, analog output, reading from a switch
- Lab 4: 7-segment LED display; coordinating multiple simultaneous outputs

Samples of previous midterms

Samples are posted on the course web site. There are two versions: one with answers, one without. Practice with the version without answers to get a realistic idea of how you would do! Remember that no calculators are allowed.

Caveat: note that for the two previous semesters, the first midterm was held about 3 weeks **later** than this semester. You will find some of the topics are *more advanced* than what we have covered to date. Focus on the questions that are covered by the review topics listed above.

One area of consistent weakness is that students have difficulty calculating equivalent resistance, mostly due to inability to correctly complete the calculations with powers of 10. You *must* be comfortable with manipulating quantities involving *milli* and *kilo*.