Test 1 Review

- Test will be coding in nature
- Focused on material in parallel interfacing
- Theoretical coding questions will be similar to the HW: e.g. value on port when button is pressed
- No overall design problem related to Keypad
    - Keypad problems similar to the HW
- No full code related to LCD.
    - LCD problem similar to the HW
- Draw a schematic of the problem

1. PORTS:
    - Port direction is DDRx (x=A,B,C,…)
    - PORTx used for output
    - PINx is used for input

2. LED design
    - Port direction is output
    - Forward drive:
        - LED is connected to ground
        - Arrow of the LED points to ground
        - output is 1 to turn ON
    - Reverse drive:
        - LED is connected to VCC
        - Arrow of the LED points to port
        - output is 0 to turn ON
    - Enable can be implemented
        - Replace ground or VCC by output pin
        - Arrow of the LED is used to determine drive direction
        - Forward drive:
            - 2 pins: one for drive, one for enable
            - Drive pin = 1, enable pin = 0
        - Reverse drive:
            - 2 pins: one for drive, one for enable
            - Drive pin = 1, enable pin = 0
3. Push button design:
    - Input is used to detect button
    - PULL UP network:
        - input = 1 when button is OFF, 0 when ON
        - Button must be grounded
        - Ground can be replaced by an enable pin:
            - enable pin = 0 for detect input; 1 to disable
    - PULL DOWN network:
        - input = 0 when button is OFF, 1 when ON
        - Button must be connected to VCC
        - VCC can be replaced by an enable pin:
            - enable pin = 1 for detect input; 0 to disable

- Debounce the button read:
    - When activity is detected, wait ~1ms and read again

4. Keyapad:
    - 4x4 keypad: Use 4 pins for output (activations), 4 pins for reading
    - 1x4 keypad: Use 4 pins for output (activations), 1 pins for reading
    - 4x1 keypad: Use 1 pin for output (activations), 4 pins for reading
    - PULL UP network on inputs (rows):
        - input = 1 when button is OFF, 0 when ON
        - to activate, column = 0
    - PULL down network on inputs (rows):
        - input = 0 when button is OFF, 1 when ON
        - to activate , column = 1
    - Must activate 1 column at a time, then read inputs
    - Must debounce

Practice Problems:

1. Example of LED problems
    a. The 8xLEDs are connected to port B is forward drive. No enable is used. Draw schematic.
    b. Val1 is an array of values. Display each value for 1 sec.
    c. Same as (a) but Use reverse drive
    d. Same as (a) but Use enable, port A pin 0.
    e. Same as (a) but instead of val1 use 8 DIP
    f. Same as (a) but if val1 is signed, display the absolute value
2. Example of pushbutton problems:
    a. 4 button connected to 4 pins of port B. Write a function that returns ‘A’, ‘B’, ‘C’, or ‘D’, when button 3,2,1, or 0 are pressed. Use pullup network and no enable pins. Draw the schematic
    b. Same as (a) but using pull down network
    c. Same as (a) but use enable on Port A pin 7.
3. Example of keypad problems:
    a. 1x4 pad write a functions to return key (A,B,C,D)
    b. 4x1 pad write a function to return key (A,B,C,D)