# ECE 376 - Test #2:  Name _____
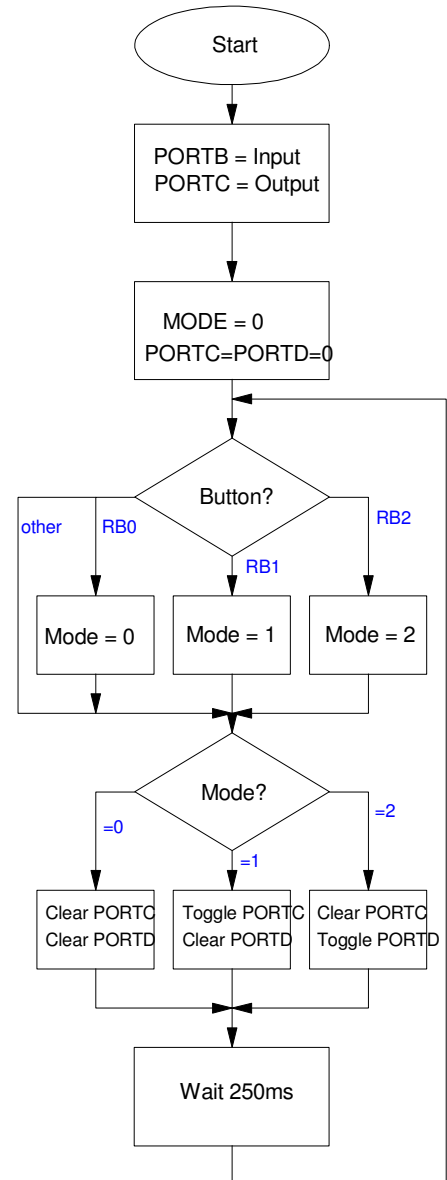
## C-Programming on a PIC Processor

### Flow-Charts & C Programming

1)  (25pt) The following flow chart turns your PIC into a tail-light controller:

- When RB0 is pressed, the lights on PORTC and PORTD turn off.
- When RB1 is pressed, the lights on PORTC blink every 250ms (left turn)
- When RB2 is pressed, the lights on PORTD blink every 250ms (right turn)
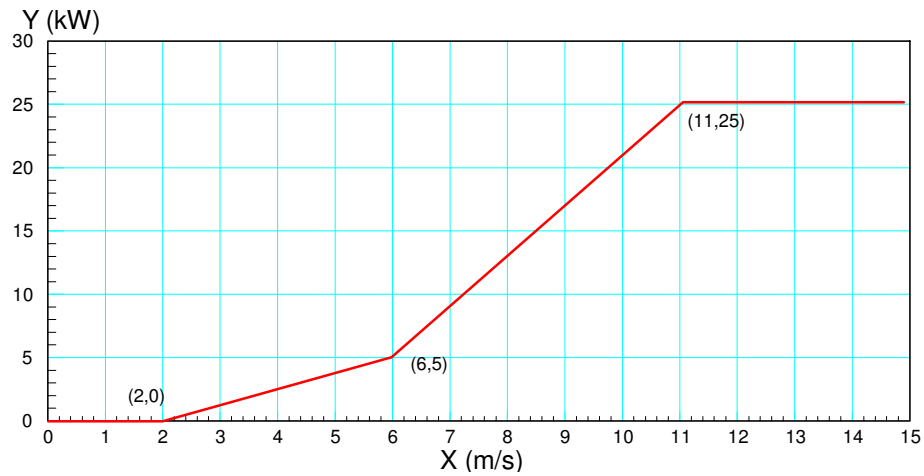
Write the corresponding C code

## C-Programming:

2) (25pt) Write a C subroutine which is

- Passed X (a floating point number in the range of 0.0 to 15.0), and
- Returns Y (a floating point nuber in the range of 0.0 to 25.0)

Assume the relationship between X and Y is as follows:

## Analog Inputs

3) (25pt)  Assume the A/D input to a PIC processor has the following hardware connection where R is a 3k thermistor where T is the temperature in degrees C
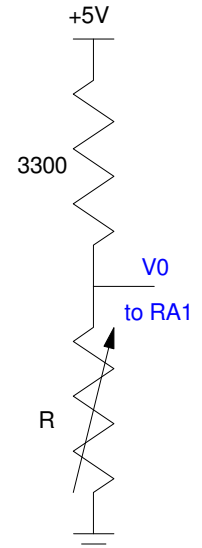
$$R = 2200 \cdot \exp\left(\frac{4100}{T+273} - \frac{4100}{298}\right) \Omega$$

Let T be your birth date (1..31) in degrees C

At this temperature, determine

- The resistance, R,
- The voltage, V0, and
- The A/D reading

| T (degees C) birth date (1..31) | R Ohms | V0 Volts | A/D Reading 0 .. 1023 |
|---|---|---|---|
|  |  |  |  |

+5V

3300

V0

to RA1

R

## t-Tests

4) (13pt) 100,000 poker hands are dealt. The number of hands with a 2-pair are:

- # hands = {4692, 4773, 4646}
- mean = 4703.7
- st dev = 64.30

Based upon this data,

a) What is the 95% confidence interval for the number of times you'll be dealt a 2-pair in 100,000 poker hands (individual test).

b) What is the 95% confidence interval for the probability of being dealt a 2-pair in poker? (population question)

| Student t-Table (area of tail) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| df \ p | 0.1% | 0.25% | 0.5% | 1% | 2.5% | 5% | 10% | 15% | 20% |
| 1 | -636.619 | -318.309 | -63.657 | -31.821 | -12.706 | -6.314 | -3.078 | -1.963 | -1.376 |
| 2 | -31.599 | -22.327 | -9.925 | -6.965 | -4.303 | -2.92 | -1.886 | -1.386 | -1.061 |
| 3 | -12.924 | -10.215 | -5.841 | -4.541 | -3.182 | -2.353 | -1.638 | -1.25 | -0.979 |
| 4 | -8.61 | -7.173 | -4.604 | -3.747 | -2.776 | -2.132 | -1.533 | -1.19 | -0.941 |
| 5 | -6.869 | -5.893 | -4.032 | -3.365 | -2.571 | -2.015 | -1.476 | -1.156 | -0.92 |

## Chi-Squared Test

5) (12pt). Suppose there are ten people in class. All ten of you raise your hands to answer a question at the same time, but you're not picked.

Use a chi-squared test to determine how many times you have to be not-picked before you can be 95% certain that people are not being called on at random (everyone has a 10% chance of being picked)?

### Chi-Squared Table

Probability of rejecting the null hypothesis

| dof | 99.5% | 99% | 97.5% | 95% | 90% | 10% | 5% | 2.5% | 1% | 0.5% |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 7.88 | 6.64 | 5.02 | 3.84 | 2.71 | 0.02 | 0 | 0 | 0 | 0 |
| 2 | 10.6 | 9.21 | 7.38 | 5.99 | 4.61 | 0.21 | 0.1 | 0.05 | 0.02 | 0.01 |
| 3 | 12.84 | 11.35 | 9.35 | 7.82 | 6.25 | 0.58 | 0.35 | 0.22 | 0.12 | 0.07 |
| 4 | 14.86 | 13.28 | 11.14 | 9.49 | 7.78 | 1.06 | 0.71 | 0.48 | 0.3 | 0.21 |
| 5 | 16.75 | 15.09 | 12.83 | 11.07 | 9.24 | 1.61 | 1.15 | 0.83 | 0.55 | 0.41 |