ECE 376 - Final: Name _____

Calculators Permitted.

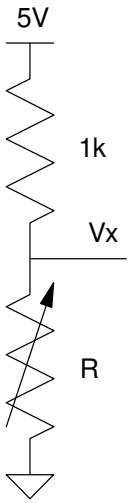
1) Binary Input: Schmitt Trigger. Design a circuit which outputs

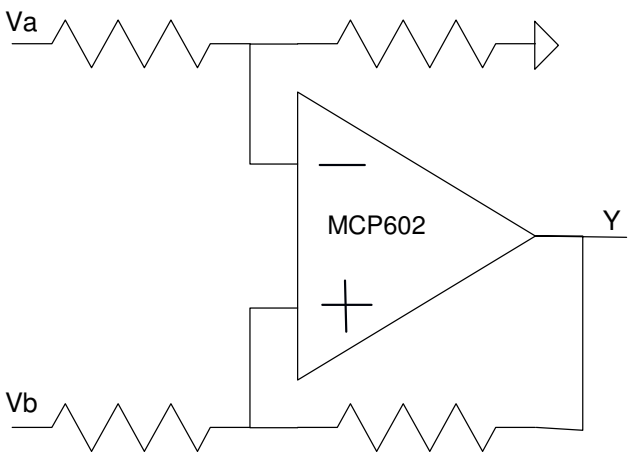
- 0V when the magnetic field is > 0.55 Gauss
- 5V when the magnetic field is < 0.45 Gauss

Assume you have a thermistor where

$$R = 1000 \cdot (1 + 0.1G)\ \Omega$$

and G is the magnetic field strength in Gauss

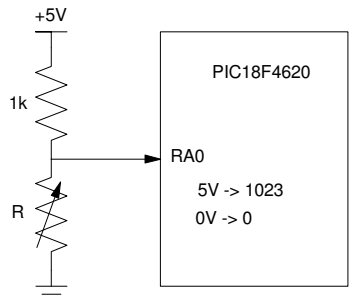




2) Analog Input: A magentic field sensor has the following resistance vs. magnetic field relationship

$$R = 1000 \cdot (1 + 0.1G)\ \Omega$$

where G is the magnetic field strength in Gauss.



2a) Determine the A/D reading for the following circuit at -1 Gauss / 0 Gauss / +1 Gauss

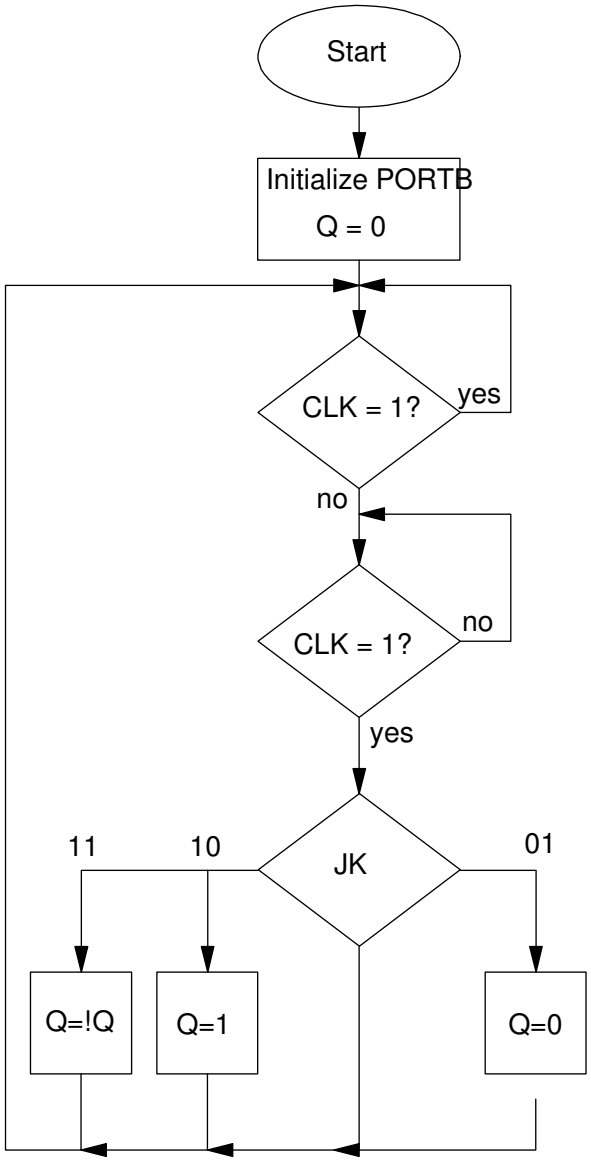
-1 Gauss	0 Gauss	+1 Gauss

2b) Give a calibration function to compute the field strength in Gauss based upon the A/D reading

2c) What is the smallest change in magetic field you can detect with your code (i.e. the resolution of this sensor)?

3) C Coding: The following flow chart is for a JK flip flop. Write the corresponding C code.

RB7	RB6	RB5	RB4	RB3	RB2	RB1	RB0
-	-	-	-	Q	J	K	CLK



4) C Programming: Write subroutine which

- Is passes a number from 0 to 5 (N), and
- Lights up that many lights on PORTC as a bar graph

N	0	1	2	3	4	5
PORTC	0000 0000	0000 0001	0000 0011	0000 0111	0000 1111	0001 1111

```
void Problem4(unsigned char N)
{
```

5) A square wave with a frequency between 1Hz and 5Hz is applied to the PIC. Write a program which can measure the period of the square wave using Timer 0 with a resolution of 1ms or better.

a) Hardware: What I/O pin do you connect the signal to and what interrupt are you using?

I/O Pin on PIC	Interrupt Used

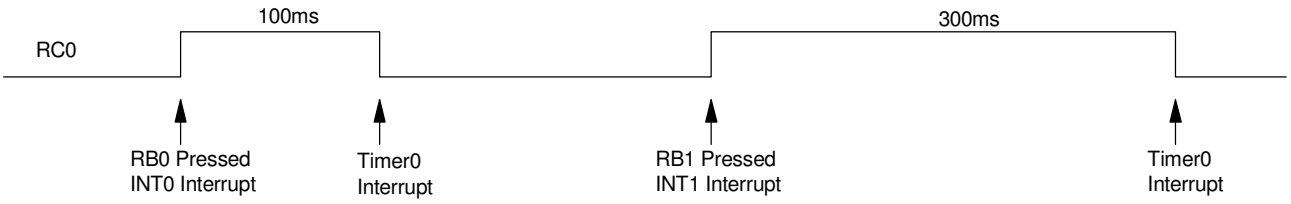
b) Interrupt Initialization (i.e. pre-scalar you are using for Timer 0/1/3 or ABC tor Timer2)

c) Interrupt Service Routine: Measure the period and compute the frequency in Hz

```
void interrupt IntServe(void) {
```

6) Interrupts Changing Interrupts: Using interrupts, generate

- A 100ms pulse on RC0 when you press RB0
- A 300ms pulse on RC0 when you press RB1



6a) Interrupt Set-Up: Specify the initialization for INT0 and Timer2 interrupts

INT0 Setup (rising edge)	INT1 Setup (rising edge)	Timer0 Setup (PS)

6b) Interrupt Service Routine:

INT0	INT1	Timer0
`if(INT0IF) {`	`if (INT1IF) {`	`if (TMR0IF) {`