Embedded and Realtime Systems

Laboratory 5   Name:_____

INSTRUCTIONS

Before attempting this lab, be sure you are familiar with I2C protocol as covered in the 24C256 I2C EEPROM Datasheet available on Moodle. This laboratory should be completed within the 3 hours allocated and submitted to Moodle as a single file. If you have multiple files, archive them together e.g. zip them into one file, before submitting. Be sure to include your names on all your work.

This laboratory utilises the on board USART and I2C peripherals.

DETAILS

Figure 1 below depicts a basic configuration of an embedded system based around the PIC16F877A.

The circuit consists of the following:

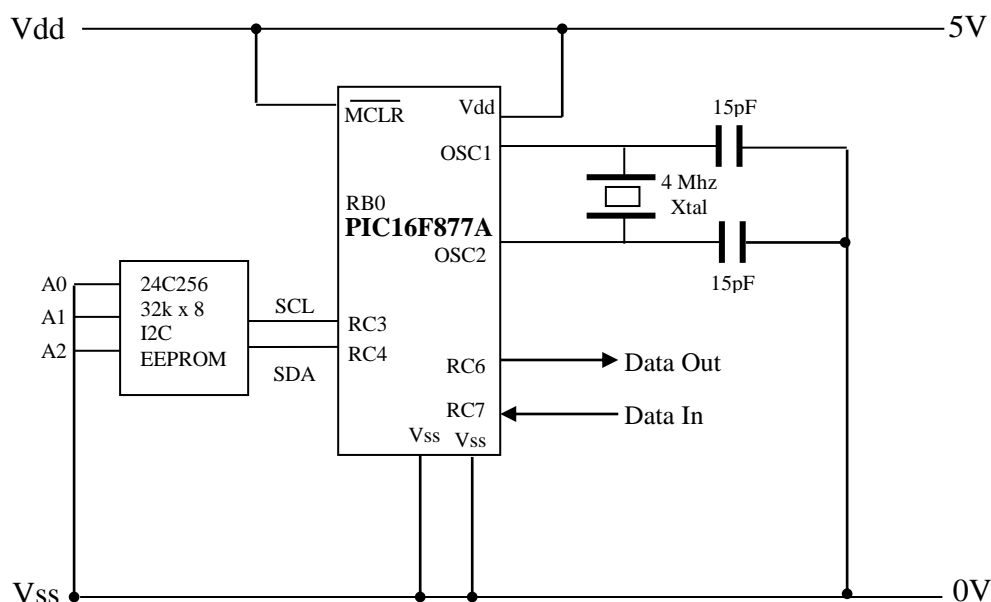|			
Fosc :	4 Mhz		
SDA :	I2C Serial Data	RC4	Needs to be set as an Input
SCL :	I2C Serial Clock	RC3	Needs to be set as an Input
DataOut :	Serial Data Output.	RC6	Output (needs to be set an **Input**)
DataIn :	Serial Data Input	RC7	Input

Figure 1

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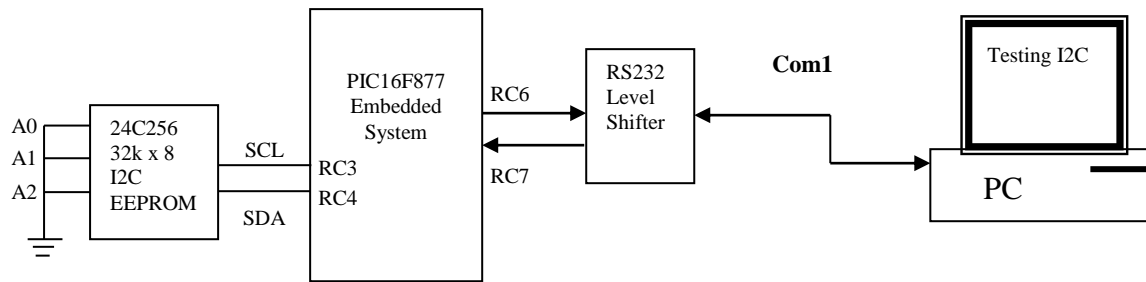Figure 2 below depicts a system overview of the embedded system and a bi-directional connection to a PC.

Figure 2

Description on Assignment

Figure 1 is an embedded system. This embedded system is connected to a PC through COM1 asynchronous serial port (Figure 2).

The configuration for the asynchronous communication should be as follows:

> 1 Start Bit
> 9600 Baud Rate
> No Parity
> 8 Data Bits
> 1 Stop Bit

There is also an external I2C EEPROM connected to the PIC16F877A on pins RC3 and RC4. The EEPROM address bits A0, A1 and A2 are all pulled low by default on this device.

PART 1 – To be completed and handed up before continuing to Part 2 and 3

A handout is provided for this question. With the provided handout,
  (a) Write a function to WRITE a byte to the external EEPROM.
  (b) Show how this function is used.
  (c) Write a function to READ a byte from the external EEPROM.
  (d) Show how this function is used.

(40 marks).

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PART 2

Sketch out the Start Condition and Stop Condition for I2C. You can reference the 24C256 EEPROM Datasheet provided on Moodle. **(10 marks).**

PART 3

An I2C library with an I2C Byte Write and I2C Byte Read function will be provided for this part once Part 1 is complete. Write a program which writes the following string "Testing I2C" to the I2C EEPROM. Then reads these characters back and then sends the characters read from the I2C EEPROM to the PC via the UART. Use best coding practices.

- **A lab demonstrator should verify the operation of your work (50 marks).**