Uva Wellassa University, Sri Lanka
End Semester Examination – June 2009
ENG 303-2 Embedded Systems

Time: Two (02) hours

Total 04 Questions
Answer **all** questions
All questions carry equal marks

01)

1. What are the main characteristics of an embedded system? Explain them briefly.

(05 marks)

2. What are the main advantages of using microprocessor for an embedded system? Explain main factors that need to be considered when selecting a suitable microprocessor for an embedded project.

(08 marks)

3. What is meant by documentation in an embedded system design? What are the main development documents used in embedded system design process? Explain the importance of documentation.

(12 marks)

02)

1. Why it is required to have standard communication protocols?

(05 marks)

2. Explain asynchronous serial communication and synchronous serial communication giving example for each.

(08 marks)

3. Explain
   a) I2C Communication
   b) SPI Communication.

   What are the main advantages and disadvantages of above communication protocols? You are required to design an inter processor serial communication method using only two pins of a microcontroller. Explain which one of the above communication methods is more suitable to achieve above task.

(12 marks)

03)

1. Why it is required to use interrupts in embedded system design. Explain it using a real world application.

(05 marks)

2. Explain how an analog signal varying from 1.5V to 3 V can be converted to digital values using PIC 16F877 Microcontroller. Digital value should be stored as a 10 bit value.

(08 marks)

3. Analog temperature sensor was interfaced to a microcontroller and ADC (Analog Digital Conversion) value was shown in a LCD (Liquid Crystal Display) for every 10 second. Though there wasn't any temperature change, value displayed in the LCD changed as shown below.

Time (s)	10	20	30	40	50	60	70	80	90	100
ADC Value (8 bits)	110	108	95	97	115	107	111	175	93	114

Discuss possible reasons for the above variation. Give suggestions how you can rectify above variation in hardware level and software level.

(12 marks)

04)

You are required to design a security system for a Museum. Museum has five rooms. Each room has 20 glass boxes where valuable items are kept. If these boxes are opened or broken in unauthorized way, an alarm should trigger in the main security room located approximately 50 m away.

1. Suggest a sensor that can be used inside glass boxes to protect valuable items. What are the main factors that need to consider when selecting such a sensor?

(05 marks)

2. There are two ways to supply power to the above sensor. Using a battery or by a separate DC power adaptor attached to a wall socket outlet. If you are the embedded system designer for this project which power supply method will you select? Give reason for your selection.

(08 marks)

3. You are required to design a communication system for the alarm system. Security guards in the main security room need to identify the room and the glass box if it is opened without permission. Once the sensor identify unauthorized access that data (room number and the glass box number) should be transmitted to the main control room which is 50 m away. You are provided with a radio transmitters and receivers which can send data up to 30 m. There are 20 glass boxes in every room. Inside rooms you are not allowed lay any communication wires. But through the ceiling beams you can lay communication wires. Use block diagram and propose a communication method to transmit data to the main control room.

(12 marks)