

**GUJARAT TECHNOLOGICAL UNIVERSITY**

M.E. SEM-I Examination January 2010

**Subject code: 710409****Subject Name: Embedded Systems Design****Date: 29 / 01 / 2010****Time: 12.00 – 2.30 pm****Total Marks: 60****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Answer the following questions: **06**
- i. Define an Embedded system giving a few examples of the same.
  - ii. What is a cross compiler? Why C language is preferred over assembly language for coding the embedded system?
  - iii. How does a real-time operating system (RTOS) differ from a conventional OS?
- (b)** A switch is connected to pin P1.2. Write an 8051 C program to monitor switch and create the following frequencies on pin P1.5: SW = 0, 500 Hz; SW = 1, 750 Hz. Use timer 0, mode 1 and  $f_{\text{crystal}} = 12 \text{ MHz}$ . **06**

- Q.2 (a)** Enlist various commands for a 16x2 LCD. Write an 8051 C program to display your name on the LCD screen. **06**
- (b)** Write an 8051 C program to generate a 10000Hz frequency on P2.1 using timer 0, mode 2 and count the 1 Hz pulses given on P3.5 and display it on P0. Assume  $f_{\text{crystal}} = 11.0592 \text{ MHz}$ . **06**

**OR**

- (b)** Write an 8051 C program to generate a 1 sec delay using timer 1 and an ISR to transmit the message 'SENT' with 9600 baud rate. Use  $f_{\text{crystal}} = 11.0592 \text{ MHz}$ . **06**
- Q.3 (a)** What is an I<sup>2</sup>C protocol? With neat figure explain the data transfer on an I<sup>2</sup>C bus clearly stating the Start, Acknowledge and Stop conditions. **06**
- (b)** Explain the Control register of RTC DS1307. What value and in which registers should be loaded to set the time 11:35:55 AM? How a square wave of 1 Hz can be generated using this RTC? **06**

**OR**

- Q.3 (a)** With reference to an RTOS, explain the concepts of *dynamic memory allocation* and *relocatability* in details with neat sketches. **06**
- (b)** What is context switching? Explain various context switching mechanisms with neat figure. **06**

**Q.4 (a)** Explain Timer 0 module of PIC16F877. Enlist all the SFRs associated with Timer 0 stating their use. **06**

**(b)** Explain the Capture and Compare modes of PIC16F877 in detail **06**

**OR**

**Q.4 (a)** Enlist the steps to follow for A/D module of PIC16F877. How a 10-bit digital output data will be stored? State the use of all the SFRs of associated with this module. **06**

**(b)** How much internal memory is available in PIC16F877? Enlist the steps to program them. **06**

**Q.5 (a)** With neat figure, explain I<sup>2</sup>C slave transmitter and receiver (10-bit address) modes of PIC16F877. **06**

**(b)** “Programmable Logic Design is useful for Embedded System Design”. Justify the statement with suitable examples. **06**

**OR**

**Q.5 (a)** Show the importance of HDL language compared to other higher languages. How is it differed from normal language in terms of specific features? Explain with examples. **06**

**(b)** How PCB design concept can be used to optimize Embedded System Design? Give suitable examples. **06**

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