Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

VI SEMESTER B.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: EMBEDDED SYSTEMS [ELE 330]

(PROGRAM ELECTIVE – I)

REVISED CREDIT SYSTEM

Time: 3 Hours   11 MAY 2016   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ANY FIVE FULL** questions.

❖ Missing data may be suitably assumed.

❖ Support all your programs with relevant comments.

1A.	Draw a neat diagram of internal organization (architecture) of 8086 and	
	i. Explain the functions of BIU and EU and list their main components	
	ii. List the various pointers and Index registers and explain their functions	*04*
1B.	Describe the following instructions of 8086. Illustrate with an example and mention the addressing mode used.	
	i. SUB BX, [6000H]	
	ii. XOR AL, [BX]	*02*
1C.	Internal marks scored by 24 students in Embedded systems subject (maximum marks: 50) are stored in successive locations starting at 50000H in the data segment. Write an 8086 ALP to determine the highest marks scored and store the highest marks in 50020H. If more than one student has scored the same (highest) marks, store the count of such students at 50021H.	*04*
2A.	List and compare the salient features of base line, mid-range and high performance '8' bit PIC microcontrollers. Give examples (microcontroller part numbers) for each category.	*03*
2B.	What do you mean by processing power of a processor? Describe how following methods increase (improve) the processing power of a processor	
	i. Harvard architecture	
	ii. Pipelined architecture	
	iii. Multiprocessor system	*04*
2C.	Highlight the salient features of Berkley RISC – I processor architecture and compare it with the CISC processors of that time.	*03*

3A. Describe the following ARM7TDMI instructions. Illustrate with an example.

    i.   ADCCSS R10 , R11 , R12 , LSR #02

    ii.   ANDAL R6 , R5 , # 0X000000FF

    iii.   MLA R1, R2, R3, R4   *03*

3B. Describe the full ascending type of stack and the instructions of ARMTDMI to implement full ascending stack   *02*

3C.   i.   Write an ARM7TDMI ALP to copy 500 half word (16 bit) data stored in successive locations starting from 0x00008000 to successive locations starting at 0x00009000.

    ii.   Write an ARM7TDMI ALP to find ASCII codes of both the nibbles of a byte data available in 0x0000A050 and store the ASCII codes in the next two locations. Use a subroutine to determine the ASCII code.   *02+03*

4A. What are the operations required to be done before returning from ARM7TDMI exception handler? With proper justification, explain the instructions used to return from various ARM7TDMI exceptions.   *03*

4B. Describe the operation performed during the three stages of an instruction execution in ARM7TDMI and explain the three stage pipeline architecture. What do you mean by pipeline flushing? Explain with the help of a relevant example.   *04*

4C. Describe and compare the various types of RAM devices used in embedded systems and general purpose systems   *03*

5A. With the help of a relevant diagram, explain the compromise protocol for write operation (with respect to parallel communication in embedded systems).   *02*

5B. Explain the following with respect to PCI parallel bus

    i.   Operating frequency and maximum data transfer rate

    ii.   (Size) of memory and I / O space.

    iii.   Configuration space per device and its use.

    iv.   Role of command and byte enable signals during data communication.   *04*

5C. Write a 'C' program for PIC16f877 microcontroller to configure the MSSP in I2C master mode to transmit data bytes AAH and BBH to slave device '1' with address 3AH and then (before stop condition is issued) transmit data bytes 55H and 66H to slave device '2' with address 48H at 1Mbps baud rate. Assume fosc = 20MHZ.   *04*

6A. Describe in detail the protocol used for data communication in CAN serial communication bus and differentiate between remote frame and data frame.   *04*

6B. List the main features of on chip ADC of PIC16f877 microcontroller. Write a 'C' program to convert the analog input applied to AN7 pin of PIC microcontroller and display the result at ports 'B' and 'D'. Use right justified result, F_{ADC} of $F_{osc}/8$, positive and negative reference voltages from AN3 and AN2 pins. All the remaining pins of ports A and E are to be used as analog input pins.   *03*

6C. With the help of a relevant diagram, explain the priority arbitration scheme with respect to interrupt expansion and compare it with daisy chain arbitration scheme.   *03*