Reg. No.



II SEMESTER M.TECH (ESM/PED) END SEMESTER EXAMINATIONS, APRIL - MAY 2017

SUBJECT: EMBEDDED SYSTEM DESIGN [ELE 5236]

REVISED CREDIT SYSTEM

Time	: 3 H	lours	Date: 27, April 2017	Max. Marl	ks: 50
Instructions to Candidates:					
	*	Answer	r ALL the questions.		
	*	Missing	g data may be suitably assumed.		
	*	Support	rt all your programs with relevant comments.		
1A.	Sho mio sta	ow the crocontro rting wit	connection diagram to connect '8' LEDs to RC0 to RC7 p roller and write an ALP to obtain running LED display (turn on th the LED connected to RB7 pin) with a suitable delay.	ins of PIC16f877 one LED at a time	(03)
1B.	Answer the following with respect to ARM7TDMI processor.				
	i ii	i. Tota (deo i. Bit v	tal Number of registers, number of general purpose registers an edicated) registers; name all the dedicated registers. wise details of CPSR register and functions of all the used bits of	d special function CPSR register.	(04)
1C.	Des	scribe th	ne following instructions of ARM7TDMI. Illustrate with an examp	ole.	
	i ii iii	i. RSC i. STR i. EOR	CCS R0, R1, R2, LSR #02 RH R2, [R1], # - 02 R R10, R11, #0x0000FFE0		(03)
2A.	'50 Wr 0x(the	', 32 bit ite an A 0000900 destinat	t numbers are stored in successive memory locations starting ARM7TDMI ALP to copy these data to successive memory loc 00; find the sum of all these data and store the 64 bit result in n ation block.	g at 0x00008000. ations starting at ext '8' locations in	(04)
2B.	Me rele cor pro	ntion the evant ex rectly in oblem an	ne instruction used to return from a subroutine in ARM7TDMI. xample, illustrate the problem associated with using this inst n case of nested subroutines. Suggest and illustrate a method nd return correctly.	With the help of a ruction to return to overcome this	(03)
2C.	i	i. List moc i. Des	t the various exceptions of ARM7TDMI along with their vector de of operation. scribe the undefined instruction exception.	address and new	(03)
3A.	Sho to (pro	ow the co GPIO pin ogram to	connection diagram to connect two common anode seven segme ns p7 to p14 and p20 to p27 of mbedNXPLPC1768 microcontrol o display numbers '00' to '99' continuously with a delay of 1.8 sec	nt display devices ler and write a 'C' conds.	(03)

- **3B.** Explain the following with respect to cache memory.
 - i. Necessity of cache memory
 - ii. Methods to improve cache and overall memory access performance.
 - iii. Write the equation to determine the average memory access time in a system with '3' levels of cache (L1, L2 and L3 with hit rates h1, h2 and h3 respectively) and main memory.
 - iv. Current trend in cache memory implementation in case of multi core processors. (04)
- **3C.** What do you mean by handshake signals? When are they necessary? Describe the handshake protocol for read and write operation in case of parallel communication. *(03)*
- **4A.** Describe the following with respect to PCI parallel communication bus
 - i. Memory, I / O and configuration space
 - ii. Data bus size, clock frequency and maximum data transfer rate.
 - iii. Bus arbitration scheme to allow multiple PCI bus masters.
- **4B.** Describe in detail all the fields with respect to data transfer in case of CAN bus serial communication protocol;

If '5' bytes of data is transferred in the data field (027D53F065H) determine the number of extra bits transferred because of bit stuffing used in CAN bus protocol. **(04)**

- **4C.** Write a 'C' program for PIC16f877 microcontroller to configure MSSP in SPI master mode to transmit data 5DH and 6EH to the slave device connected to RB0 pin and then transfer the data 7FH to the slave device connected to RB1 pin; store the received bytes internally. Use baud rate of 1.25Mbps , idle state for clock as high level, data output at rising edge of clock, sample input data at the end of data output time. Assume fosc = 20MHz.
- **5A.** Describe the salient features of IRDA Wireless communication protocol; list the various standards and data transfer rates supported by IRDA.

With the help of a relevant diagram, describe the functions of IR encoder / decoder and IR transceiver in realizing SIR communication. (03)

- **5B.** i. Describe the algorithm for converting analog input to digital by on chip ADC in PIC 16f877 microcontroller.
 - ii. Write a 'C' program to convert the analog input applied to RA0 / AN0 pin of PIC16f877 microcontroller and display the result at ports 'B' and 'D'. Use left justified result, conversion time of 24μ s, positive and negative reference voltages from RA3 / AN3 and RA2 / AN2 pins. All the remaining pins of ports A and E should be available as digital I / O pins. Take $F_{osc} = 4$ MHz.
- **5C.** i. What are the uses of a watchdog timer? Describe the working of watchdog timer available in PIC16f877 microcontroller.
 - ii. With the help of a relevant pseudo code describe the ATM time out operation using a watchdog timer. **(04)**

(03)

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