MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
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IV SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)
END SEMESTER EXAMINATIONS, APRIL / MAY 2019

SUBJECT: EMBEDDED SYSTEMS DESIGN [ICT 2253]
REVISED CREDIT SYSTEM
02/05/2019

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:
❖ Answer **ALL** the questions.
❖ Missing data, if any, may be suitably assumed.

1A. Explain the following ARM instructions with an example for each:
i) RSBLT   ii) LDRSB   iii) BPL   iv) ORN   v) MLS   **5**

1B. Write an embedded C program using interrupts to toggle P0.2 for every 2 pulses received at P0.1 while simultaneously displaying the number of pulses received at EINT2 (P2.12, function-2) on the LEDs connected to P0.11-P0.4. (PCLK = 3 MHz)   **3**

1C. Bring out the salient features of CISC family of microcontrollers.   **2**

2A. Explain the operation of PWM module with a necessary diagram. Explain the role of following registers associated with PWM.
    i) PWM Control Register
    ii) Latch Enable Register
    iii) Shadow Register
    iv) Match Register-0   **5**

2B. Assume that output of a square wave generator is connected to P1.29(CAP 1.1, Function-3). Write an embedded C program to generate a square waveform on P1.25 (MAT 1.1, Function-3) whose frequency is *one fourth* of the frequency of the square wave input at P1.29.   **3**

2C. It is required to design an analog voltage comparator using ADC channel-1(A) and channel-2(B). The comparator outputs (A>B), (A<B) and (A=B) are available on GPIO lines. Explain how this task can be accomplished using SOFTWARE mode of an ADC.   **2**

3A. Define the term "Addressing mode". Explain the various addressing modes of ARM micro controller.   **5**

3B. With a neat diagram, explain how a 16x2 LCD can be interfaced in 8-bit mode to the ARM microcontroller. Also, list and explain various LCD configuration commands.   **3**

3C. Bring out the differences between
    i) Fully ascending stack and fully descending stack
    ii) Memory mapped IO and IO mapped IO   **2**

4A. Explain with a neat diagram, how the 2-digit multiplexed seven segment display is interfaced to ARM microcontroller. Write an embedded C program to display a 2-digit hexadecimal number on this display. 5

4B. Write an embedded C program to generate a sawtooth waveform with peak to peak amplitude 3.3 volts and period 200 ms at A_{OUT} (P0.26, function-3). 3

4C. Given the contents of registers R1= -2, R2= -7, R3= -12, R4= -25 and R13=0x10000010. Write the content of the stack pointer and 32-bit data stored in the address 0x10000004 after the execution of the instruction STMDB R13!,{R1-R4}. 2

5A. Explain the role of various Special Function Registers used to configure the baud rate for serial communication. Write an embedded C program using serial interrupt to transfer the message "*Excellence in Technical Education through Innovation and Teamwork*" serially on TxD0 (P0.2, function 2), at 9600 baud. Assume 1-start bit, 1- stop bit and 8-bit data. (PCLK=3 MHz) 5

5B. With a neat diagram, explain the stepper motor interfacing to ARM microcontroller. 3

5C. Write an embedded C program to simulate a 4:1 MUX assuming P.0-P0.3 as MUX inputs and P0.4-P0.5 as selection inputs and P0.6 as output. 2