Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. (COMPUTER & COMMUNICATION ENGG.) ONLINE GRADE IMPROVEMENT / MAKE-UP EXAMINATION, AUGUST 2021

SUBJECT: EMBEDDED SYSTEMS DESIGN [ICT 3271]

REVISED CREDIT SYSTEM 07/08/2021

Time: 2 Hours

MAX. MARKS: 40

Instructions to Candidates:

Answer ANY FOUR FULL questions.

- Missing data, if any, may be suitably assumed.
- 1A. Explain the salient features of RISC family of microcontrollers.
- **1B.** Define the term "Addressing mode". Explain the various addressing modes of ARM micro controller.
- 2A. Explain the following ARM instructions with an example for each:i. RSBLT ii. BPL iii. MLS iv. PUSH v. TST
- 2B. Write an assembly language program to convert a 4-digit BCD number available in the code memory into hexadecimal using a function which converts a 2-digit BCD into hexadecimal. 5
 5 Store the result in the data memory.
- 3A. 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 BCD on this display.
- **3B.** With a neat diagram, explain how a 16x2 LCD can be interfaced in 4-bit mode to the ARM microcontroller.
- **4A.** 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 the P1.25 (MAT 1.1, Function-3) whose frequency is *one eighth* of the frequency of the square wave input at P1.29.
- **4B.** 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
- 5A. Explain "Double buffering" in DAC. Write an embedded C program to generate a sinusoidal waveform of frequency 2 KHz at A_{OUT} (P0.26, Function-3) with peak to peak amplitude of 2 volts and DC value of 1.2 volts.

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- **5B.** Explain the operation of ADC in burst mode. Explain the role of following registers associated with ADC.
 - i. A/D Control Register (ADCR)
 ii. A/D Status Register (ADSTAT)
 iii. A/D Global Data Register (ADGDR)
 iv. A/D Interrupt Enable Register (ADINTEN)
- **6A.** Assume that a square waveform is input at pin P2.12 (EINT-2, Function-1). Write an embedded C program to display the frequency of this square waveform on the LEDs connected to P0.11-P0.4.
- 6B. 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 "Universal Human Values" serially on TxD0 (P0.2, function 2), at 9600 baud. Assume 1-start bit, 1- stop bit and 8-bit data. (PCLK=3 MHz)

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