Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (COMPUTER AND COMMUNICATION ENGINEERING)

MAKEUP EXAMINATIONS, JUNE 2019

SUBJECT: EMBEDDED SYSTEMS DESIGN [ICT 2253]

REVISED CREDIT SYSTEM
(17/06/2019)

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) SMULL ii) MLA iii) BGE iv) TEQ v) ADDEQ **5**

1B. Assume that columns of a 2x2 matrix keyboard are connected to P2.10-P2.11 and rows are connected to P1.0-P1.1. Write an embedded C program using GPIO interrupt to display the keycode of the key pressed on LEDs connected to P0.0 to P0.1. **3**

1C. Differentiate between single edge and double edge PWM. **2**

2A. Explain the operation of ADC module of ARM microcontroller. 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) **5**

2B. 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 Port-0. **3**

2C. Write an embedded C program to simulate a 2-4 decoder assuming P.0-P0.1 as control inputs and P0.4-P0.7 as output lines. **2**

3A. With a neat diagram, explain how a 16x2 LCD can be interfaced in 4-bit mode to the ARM microcontroller. Write an embedded C program to display the message "*All is well*" at the beginning of first line. . **5**

3B. What is "Double Buffering" in DAC? List and explain the role of various Special Function Registers in double buffering. **3**

3C. Given the contents of registers R1= -4, R2= -1, R3= -5, R4= 4. What is the content of R1 register after the execution of SMLAL R1,R2,R3,R4 instruction? **2**

4A. Write an embedded C program using interrupts to generate a square waveform of frequency 200 kHz and duty cycle 57% on P2.3 using TIMER-0 while simultaneously generating a cosine waveform with peak to peak amplitude of 2 volts and frequency of 100 KHz at A_{OUT} (P0.26, function-3). (PCLK = 3 MHz) 5

4B. Write an assembly language program to convert a 2-digit hexadecimal number available in the code memory into BCD and store result in the data memory. 3

4C. Differentiate between Burst mode and Software mode of an ADC. 2

5A. Explain the necessity of following UART registers in serial communication:
i) THR ii) RBR iii) DLL iv) IER v) IIR 5

5B. What is "PWM"? Explain how the intensity of a LED can be controlled using PWM. 3

5C. Differentiate between Von Neumann and Harvard architecture. 2