Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH. (INFORMATION TECHNOLOGY)

END SEMESTER EXAMINATIONS, NOVEMBER 2019

SUBJECT: EMBEDDED SYSTEMS [ICT 3102]

REVISED CREDIT SYSTEM
18/11/2019

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. MLS ii. BHS iii. RSCGT iv. RRXS v. LDM **5**

1B. Write an embedded C program using interrupts to toggle a LED connected to P0.2 for every 3 pulses received at P2.10 (EINT0, Function-2) while simultaneously displaying the number of pulses received at P0.0 on the LEDs connected to P0.11-P0.4. (PCLK = 3 MHz) **3**

1C. Explain the operation of LCD in 4-bit mode. **2**

2A. Explain the operation of ADC module of ARM microcontroller. Explain the role of the 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 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 sixth of the frequency of the square wave input at P1.29. **3**

2C. Explain the following addressing modes of ARM microcontroller with an example for each:
i. Post Indexed
ii. Pre Indexed with writeback **2**

3A. 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 "*Institute of Eminence*" 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**

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

3C. What is the role of Nested Vectored Interrupt Controller in handling the interrupts? **2**

4A. Write an embedded C program to glow an LED connected to P1.23 (PWM1.4, Function-2) with 75% intensity level as long as switch connected to P2.12 is pressed and 25% intensity level whenever the switch is released. **5**

4B. Explain with a neat diagram, how the stepper motor is interfaced with ARM microcontroller. Write an embedded C program to rotate the motor 10 steps in the clockwise direction. **3**

4C. Bring out the salient features of CISC family of microcontrollers. **2**

5A. With the aid of a neat diagram explain how 4 × 4 matrix keyboard can be interfaced to ARM microcontroller. Write an embedded C program to scan the keyboard for a key press and display the key code of the key pressed on the seven segment display. **5**

5B. Write an assembly language program to find the GCD of two 2-digit BCD numbers available in the code memory and store result in the data memory. **3**

5C. Bring out the differences between

i. Single edge and double edge PWM

ii. Level triggered and edge triggered interrupt **2**