Reg. No.										

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MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

FOURTH SEMESTER B.Tech(CCE) DEGREE END SEMESTER EXAMINATION, MAY 2016
SUBJECT: EMBEDDED SYSTEM DESIGN - ICT 2253
(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **12/05/2016** **MAX. MARKS: 50**

Instructions to candidates

- Answer **ALL** questions.
- Missing data, if any, may be suitably assumed.

1A. Explain the following ARM instructions with an example to each:
i) CBZ ii) STRH iii) MLS iv) ORNS v) MVN

1B. Assume that the following error free program is executed after microcontroller is RESET:

```
        ldr r0,= -4
        ldr r1,=3
        ldr r2,=-3
        ldr r3,=-1
        smlal r2,r3,r0,r1
        mvn r2,r2
        add r2,r2,#1
up      rrx r2,r2
        tst r2,#1
        add r3,r3,#1
        bne up
```

What is the content of register r3? Justify.

1C. Differentiate between circuit clock and peripheral clock. Explain the mechanism for peripheral clock and circuit clock generation in ARM microcontroller.

[5+3+2]

2A. Assume that a switch is connected to P2.11 (EINT1, Function-1) and a seven segment display is connected to P0.11-P0.4. Write a C program using interrupts to display the number of times switch connected to P2.11 is pressed on the seven segment for every 10 seconds (number of times ≤ 9).

2B. What do you mean by "fully descending stack"? Explain the role of STMDB and LDM instructions in implementing a fully descending stack with an appropriate example.

2C. Define the terms:
(i) Resolution of a DAC
(ii) Pulse Width Modulation

[5+3+2]

3A. Explain the necessity of the following UART registers in serial communication:
i) THR ii) RBR iii) DLL iv) IER v) IIR

3B. Write an embedded C program to generate a cosine waveform at A_{OUT} (P0.26 , function-3) with a DC bias of 1.5 volts and peak to peak amplitude of 2 volts.

3C. Explain the salient features of RISC family of microcontrollers.

[5+3+2]

4A. Assume that columns of a 3x3 matrix keyboard are connected to P2.0-P2.2 and rows are connected to P1.0-P1.2, write an embedded C program using keyboard interrupt to display the key code of the key pressed on a seven segment display while turning ON and OFF an LED connected to P2.3 for every second.

4B. Define the term "Addressing mode". Explain various indexed addressing modes of ARM microcontroller with suitable examples.

4C. It is required to find the difference in analog voltages applied at ADC channel-3 and channel-4. Explain how this task can be accomplished using BURST mode of ADC.

5A. Write an assembly language program to find the factorial of an unsigned byte in the code memory using recursion and store the result in the data memory. [5+3+2]

5B. With the aid of a neat diagram, explain how a stepper motor can be interfaced to microcontroller

5C. What is the importance of Shadow and Load Enable registers in PWM module? [5+3+2]

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