Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

FIFTH SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION - NOV/DEC 2016
SUBJECT: MICROCONTROLLER (ECE - 3102)

TIME: 3 HOURS **MAX. MARKS: 50**

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A. Draw the ARM core dataflow model. Explain the following:
   a. Load store architecture
   b. Inline barrel shifter
   c. Conditional execution.

1B. Write a valid difference between the following
   a. ARM operating modes
   b. ARM programming states
   c. ARM and THUMB instructions set

1C. After a certain instruction execution, the PSW of 8051 microcontroller has the value 98H. Explain the significance of the value.

(5+3+2)

2A. List the pins related in 8051 MC for performing the following operations. Also mention whether they are input or output pins.
   a. Serial communication
   b. Interrupt programming
   c. Counting external events
   d. Receive clock pulses
   e. 16-bit address and 8 bit data

2B. Explain SFRs used for 8051 interrupt programming with neat bit diagram.

2C. Explain with an example, how stack instructions (thumb instruction set) can be used to enter and exit from a subroutine.

(5+3+2)

3A. Write a single program for 8051 microcontroller to perform the following:
   a. Read single BCD digits B1, B2 and B3 from Port0, Port1 and Port2 respectively.
   b. If B1 = 0 then find GCD of B2 and B3
   c. If B1= 9 then perform BCD addition of B2 and B3

   Display the result on Port3.

3B. Encode the ARM instruction ADDLS R0, R1, R1.

3C. Write an assembly language program for ARM processor to count number of 1's present in a 32-bit number and store the count in register R4.

(5+3+2)

4A. Write an assembly language program to continuously receive 10 bytes serially at 4800 baud, check whether the received byte is even or odd and store them separately in different internal RAM locations of 8051 microcontroller using subroutine.

4B. Describe significance of the following on-chip peripherals present in LPC1768.

a. Timer
b. RTC
c. WDT

4C. Write the 3-stage pipeline (as per ARM7) execution flow of the following sequence of instructions till 8 clock cycles.

```
        MOV r2, #8
        ADD r1, r3, r3, LSL #1
        B L2
        SUBS r4, r4, r2
        EORS r1, r3, r4
        MOV r2, #5
L1:     B L1
L2:     MUL r3, r2, r2
        ANDS r5, r3, r0
        MOV PC, LR
        END
```

(5+3+2)

5A. Assume a switch is connected to the pin P1.0 of the processor and 4 LEDs to P2.0, P2.1, P2.2 and P2.3 of the controller. Port 1 address is 0xFFFF0000 and Port 2 address is 0x0000FFFF. Write an ALP to display a BCD up counter on the LEDs when the switch is pressed else display BCD down counter on the LEDs. The switch bounce period is 0 ms.

5B. What is the significance of pin P3.4 of 8051 microcontroller? A switch is connected to P3.4 of 8051 microcontroller. Write a program to count the number of times the switch is pressed and display the count on Port 2.

5C. How is AHB different from ASB?

(5+3+2)