Reg. No.										

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

V SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, NOV/DEC 2015

SUBJECT: MICRONTROLLER BASED SYSTEM DESIGN [ELE 311]

REVISED CREDIT SYSTEM

Time: 3 Hours 07 DECEMBER 2015 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.
- Support all your programs with relevant comments.

1A. Describe the following and compare their merits and demerits. Also give relevant examples.

I. Microcontroller and Microprocessor.

II. Princeton (Von Neumann) and Harvard architectures. **(03)**

1B. What are assembler directives? Explain any four of them **(02)**

1C. I. Write 8051 ALP to calculate factorial of 5 and store the result in HEX format in location 40H.

II. Write 8051 ALP such that, if all bits in lower nibble of the value stored in 40H are high(lower nibble = 1111), then store FFH in 41H, else store 00H in 41H; if all bits of upper nibble of 40H are low (upper nibble = 0000), store FFH in 42H, else store 00H in 42H. **(05)**

2A. Discuss in detail the steps involved while executing LCALL instruction to implement subroutine. Illustrate the same with suitable example. **(02)**

2B. I. Write 8051 ALP to find whether given 8 bit data stored in location 60H is odd or even. If odd, store 00H in accumulator and If even, store FFH in accumulator. Also count the number of 1's and 0's in the same 8 bit data stored in location 60H. Store the count of 0's and count of 1's in location 61H and 62H respectively.

II. Write an ALP to compare two eight bit numbers NUM1 and NUM2 stored in external memory locations 8000H and 8001H respectively. Reflect your result as: If NUM1<NUM2, SET LSB of memory location 2FH. If NUM1>NUM2, SET MSB of 2FH. If NUM1 = NUM2, then Clear both LSB & MSB of 2FH. **(06)**

2C. Calculate the exact time delay offered by the following program. Assume XTAL = 20MHz.

```
        ORG 0000H
        MOV R6,#0FH
        MOV A,#09H
LOOP2: MOV R7,#0FFH
LOOP1 : NOP
        DJNZ R7, LOOP1
        NOP
        DJNZ R6,LOOP2
        NOP
        MOV B,#03H
        DIV AB
        MOV R3, A
LOOP3: DJNZ R3, LOOP3
        END
```

(02)

3A. Specify and explain what is done by the following 8051 ALP. Assume XTAL = 10MHz.

```
        MOV TMOD, #10H
REPEAT:MOV R0, #0AH
        CPL P1.3
BACK:   MOV TL1, #05H
        MOV TH1, #50H
        SETB TR1
WAIT:   JNB TF1, WAIT
        CLR TF1
        CLR TR1
        DJNZ R0, BACK
        SJMP REPEAT
```

(03)

3B. Describe and differentiate between operation of 8051 timers in timer mode and counter mode. List the various uses (applications) of timer mode of operation and counter mode of operation. Determine the value to be loaded to TMOD register to configure timer '0' in mode 0, with internal clock , external start/ stop control and timer '1' in counter mode, mode '2' with internal start/ stop control. **(03)**

3C. Write an 8051 main program to read the input data from the input device connected to port '0' and display it at the output device connected to port '2'. Keep doing this continuously. When 8051 interrupted through edge triggered external interrupt '1' (P3.3/ $\overline{INT1}$), write an ISR to blink the LED connected to P1.4 pin for '2' seconds and then return back to main program. Use timer '0' in mode '2' to obtain the required delay. Assume XTAL = 12MHz. **(04)**

4A. Write a note on RS232 serial communication standard. Discuss the necessity of voltage converters in case of serial communication using RS232. Does RS232 support synchronous serial communication? Justify your answer. Show the typical connection diagram for connecting 8051 serial port to RS232 port using MAX232 voltage converter. **(03)**

4B. Write an 8051 ALP to transmit ASCII codes for numbers '0' to '9', continuously, serially at 19,200 baud to an external device connected to TXD pin of 8051. Assume XTAL = 11.0592MHz. **(03)**

4C. Show the interfacing circuit to interface a '14' pin, 16 X 2 LCD to 8051 and write an ALP to display "Manipal University" on the LCD display screen. Display Manipal at the center of first line and University at the center of second line. **(04)**

5A. Interface DAC 0800 to 8051 and write 8051 'C' program to obtain a 2.5V, 1KHz, 25% duty cycle rectangular waveform. Use timer '1' in mode '2' to obtain the required delay. Digital input to the DAC is provided through port '1'of 8051. Assume XTAL=10MHz. Show the interfacing circuit. **(03)**

5B. Interface a matrix keyboard (2X3 Matrix) containing 6 keys 'A' to 'F' to 8051. Use port 1' pins for the rows and port '0' pins for the columns. Show the connection diagram and write 8051 ALP to scan keys, detect key closure and display ASCII code of the key pressed at port'2'. **(04)**

5C. Show the interfacing circuit to interface a 4 pole stepper motor with 25 rotor teeth to 8051 using ULN 2003 driver IC. Write an 8051 ALP to rotate it through 72° once in clockwise direction. Use half stepping ('8' step) sequence. **(03)**

6A. Interface following external memory devices to 8051. Show the complete interfacing circuit. Avoid fold back space. (Use absolute decoding).

i. 4K X 8 Data ROM starting at B000H.
ii. 8K X 8 Data RAM starting at C000H.
iii. 2K X 8 EPROM as program memory starting at 0000H. **(05)**

6B. Describe the functions of all the 40 signals (pins) of 8255, PPI. Design an interfacing circuit to interface 8255 to 8051 such that the base address of 8255 is 58H. Write 8051 instructions to configure Port 'B' as output port and all other ports input port in mode '0'; read the input value from port 'A' and store it at internal RAM location 50H. **(05)**