Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

FIFTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION
DECEMBER 2018/JANUARY 2019
SUBJECT: MICROCONTROLLERS (ECE - 3102)

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

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

1A. Draw and explain the Power-On reset circuit in 8051. Write the status of PC, DPTR, SP & PSW of 8051 after reset.

1B. Mention the name of Addressing mode that each instruction in the following list belongs to

i. PUSH 88h ii. ANL P1, #11111110b iii. XRL A,30H
iv. XCH A, @R0 v. ADD A, R6 vi. MOVC A,@A+DPTR

1C. Write differences between the following

i. 8051 Timer and 8051 Counter
ii. Microprocessor and Microcontroller
iii. PROM and EPROM

4+3+3

2A. A heating oven in a manufacturing process is to be maintained at a temperature level between 210° C and 215°C. The controller device is to be based on an 8051 microcontroller. Two temperature sensor devices are fitted to the oven gives the input to the 8051 as follows:

i. Sensor A outputs a Logic 0 if temperature exceeds 215°C
ii. Sensor B outputs a Logic 0 if temperature falls below 210°C

Assume that sensors are connected to 8051 through interrupt pins.
Draw the interface diagram showing all the connection to the sensor and LCD
Write an ALP to display the status of the oven temperature as follows:

i. "Above 215°C" if temperature is greater than 215°C
ii. "Below 215°C" if temperature is less than 215°C
iii. "Within the range" if temperature is between from 210°C and 215°C

2B. Assume, two 8-bit numbers C1 and C2 are stored in memory. The operation between these numbers is dictated by the bits 5 and 6 of another 8-bit number C3 as follows:

If bit 5 = 1 and bit 6 = 0, then
C1=(C1 AND C2) OR F0H
C2=(C1 XOR C2) AND F0H
If bit 5 = 0 and bit 6 = 0, then
C1=(C1 AND 07H) OR C2
C2=(C2 OR 90H) XOR 50H

Otherwise, send FFH to port P1. Develop an 8051 assembly language program to do this.

6+4

3A. Assume an 8-bit DAC is connected to PORT0 & two switches are connected to pins P3.2 and P3.3. When a switch is pressed, the corresponding line goes low.
Using interrupts, write a program to
   i. Generate a triangular wave for one cycle, if the first switch is pressed
   ii. Generate a square wave for one cycle, if the second switch is pressed

3B. What do you mean by interrupts? What are the differences between polling and interrupts?

3C. Explain briefly the following instructions of 8051 with syntax
   i. MOVC ii. SWAP iii. RETI

4+3+3

4A. Write an 8051 assembly language program to read the message "HELLO, HOW ARE YOU?" available in the code ROM and transmit it serially at 4800 baud rate, 8-bit data and 1 stop bit continuously. Assume that crystal frequency of 8051 microcontroller is 11.0592 MHz. Note: Store the above message from 9000H onwards in program memory.

4B. Draw the format of CPSR register of ARM and explain the significance of each bit. Describe the significance of r13 and r14 registers of ARM processor

4C. Explain the following assembly directives of ARM processor:
   i. RN ii. ALIGN iii. DCW

4+3+3

5A. Draw and explain the ARM core dataflow model in detail.

5B. In ARM, assume r0=0x12345678, r1=0x40001200, r2=0x00001204, r3=0x00001206, r4=0x40001104, r5=0x00001000, r6=0x00002000, r7=0x4000121C and the content in memory starting from 0x40001200 address is given in **Table 5B**. Rewrite the content of all the affected registers and memory locations after executing each of the following instruction:
   i. STRB R0, [R1, #0x14]! ii. LDRSH R3, [R4, R5, ASR #4] iii. LDRB R6, [R7], #4

5C. With neat format describe all the fields of data transfer instruction in the ARM processor.

4+3+3

Table 5B

Memory address	32-bit value
0x40001200	0x20001000
0x40001204	0x20002000
0x40001208	0x20003000
0x4000120C	0x20004000
0x40001210	0x20005000
0x40001214	0x20006000
0x40001218	0x20007000
0x4000121C	0x20008000
0x40001220	0x20009000
0x40001224	0x2000A000