Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

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A Constituent Institution of Manipal University

II SEMESTER M.TECH (ESM/PED) MAKE UP EXAMINATIONS, JUNE 2017

SUBJECT: EMBEDDED SYSTEM DESIGN [ELE 5236]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 20 JUNE 2017** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Support all your programs with relevant comments.

1A. i. List the salient features of PIC16f877 microcontroller.

ii. Describe the following instructions of PIC16f877 microcontroller. Illustrate with an example.

a. MOVWF f

b. DECFSZ f,d ***(04)***

1B. i. Discuss the limitations of using clock speed or number of instructions executed per unit time to assess the performance of processors.

ii. Write a note on processor benchmarks; DHRYSTONE and EEMBC ***(04)***

1C. Write ARM7TDMI assembly code for the following 'C' code. Consider registers R0 and R1 for variables 'a' and 'b' respectively.

```
while ( a!=b)
{
        if (a >b)
          a = a –b;
        else
          b = b –a;
}
```

(02)

2A. i. Describe the instructions of ARM7TDMI to call a subroutine and to return from subroutine.

ii. Write an ARM7 subroutine to obtain the ASCII equivalent of both the nibbles of an '8' bit binary number passed to the subroutine through D7 – D0 bits of R0 register. Return the result through R1 and R2 registers. ***(04)***

2B. i. List the sequence of operation in ARM7TDMI when an exception occurs.

ii. Write a note on pre fetch abort exception. ***(03)***

2C. i. Describe the three stages of instruction execution in ARM7TDMI.

ii. With the help of a relevant example, discuss the necessity of pipeline flush during branching operations. ***(03)***

3A. Show the connection diagram to connect a common cathode seven segment display device to GPIO pins p10 to p17 of mbedNXPLPC1768 microcontroller and write a 'C' program to display numbers '0' to '9' continuously with a delay of 1.5 seconds. ***(03)***

3B. Describe in brief the following memory devices and compare them with respect to storage permanence and write ability.

i. Masked ROM
ii. PROM.
iii. EPROM
iv. Flash ROM. ***(04)***

3C. With the help of relevant diagrams, describe the compromise protocol for read operation and write operation. ***(03)***

4A. Describe the role of following signals with respect to PCI parallel communication bus

i. C/ BE 3 – C/BE0
ii. FRAME.
iii. $\overline{IRDY}$. ***(03)***

4B. Answer the following with respect to I2C serial communication bus.

i. Salient features; available I2C standards
ii. Connection of devices to I2C bus in multi master, multi slave configuration.
iii. I2C communication protocol. ***(04)***

4C. Write a 'C' program for PIC16f877 microcontroller to configure MSSP in I2C master mode to transmit data 39H and 4AH to the slave device with address 0EH at 1Mbps baud rate. Assume fosc = 20MHz. ***(03)***

5A. Explain the USB serial communication protocol to send

i. Token packet
ii. Data packet
iii. Status packet. ***(03)***

5B. Answer the following with respect to analog to digital converters.

i. Resolution of ADC (Definition and expression to determine resolution)
ii. Unipolar and bipolar ADC
iii. Salient features of on chip ADC of PIC16f877 microcontroller. If the analog input applied is 4.1V, V_{ref+} = 4.7V and V_{ref-} = 0V, determine the values of ADRESH and ADRESL registers with a. left justified result and b. Right justified result. ***(04)***

5C. With the help of a relevant diagram, describe the daisy chain arbitration scheme to expand the processor interrupts. List the merits and demerits of this scheme by comparing it with priority arbitration scheme. ***(03)***