MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

V SEMESTER B.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING)
MAKE-UP EXAMINATIONS, MAY 2018

SUBJECT: MICROCONTROLLER BASED SYSTEM DESIGN [ELE3106]
REVISED CREDIT SYSTEM

Time: 3 Hours	Date:17, MAY 2018	Max. Marks: 50

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

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

    I.   Princeton (Von Neumann) and Harvard architectures.

    II.   General purpose and embedded systems. **(04)**

1B. Set of '13' data bytes are stored in successive locations starting from 50H. Write an ALP to check whether the numbers are divisible by 04H. Store all numbers divisible by '4' in locations starting at 61H and count of such numbers in 60H. **(03)**

1C. Describe the 8051 instructions used to access (read and write) external RAM with '16' bit memory address. Illustrate with relevant examples. **(03)**

2A. Write an 8051 ALP to find the maximum score obtained in a particular course evaluated out of 50marks for a class strength of 40 students. The data is stored in external RAM locations starting from 2000H onwards. Display the maximum marks scored at port '0'. If more than one student has scored the same (highest) marks, display the count of such students at port '1'. **(04)**

2B. Explain the functions of the following pins (signals) of 8051 microcontroller.

    i.   XTAL1 and XTAL2
    ii.   P0.0 / AD0 – P0.7 /AD7 **(03)**

2C.   i.   Write an 8051 ALP to obtain delay of 1.3 second using '8' bit registers as delay registers (do not use timer). Assume crystal frequency as 11.0592MHz.

    ii.   If the crystal frequency is changed to 10MHz. modify the delay code to obtain the same time delay of 1.3 second. **(03)**

3A. Describe the operation of 8051 timers in counter mode. What is the source for external clock pulses? Use timer '0' of 8051 in counter mode and write an ALP to determine the frequency of the external pulse applied to it. Display the value of frequency at P0 and P1. Assume crystal frequency as 11.0592MHz. *(04)*

3B. Write an 8051 main program to configure external interrupt '0' as a level triggered interrupt and keep waiting for interrupt. When interrupted, write an ISR to obtain a 500Hz, 40% duty cycle rectangular wave at P1.0 pin. Use timer '1' in mode '1' to obtain the necessary delay. Assume XTAL = 11.0592MHz. *(03)*

3C. Write an 8051 ALP to transmit the message "Available" in serial mode at 4800 baud rate. Assume XTAL = 11.0592MHz. *(03)*

4A. Explain the function of all the '14' pins (signals) of a 16x2 LCD display. What is the role of busy flag in LCD? How can busy flag be accessed? *(03)*

4B. Show the interfacing circuit to interface a hex key pad (numbers '0' to ''F') as 4 X 4 matrix to 8051 and write an ALP to detect the key pressed and display the ASCII code of key pressed at port '2'. Use software debouncing technique. *(04)*

4C. Show the interfacing circuit to interface DAC 0800 to 8051 and write an ALP to obtain a sinusoidal wave form of peak to peak voltage '4' V and offset of '2' V. *(03)*

5A. i. Write a note on register bank of ARM7TDMI
 ii. Name the various operating modes of ARM7TDMI and list the visible registers in each of these modes. *(03)*

5B. Describe the following instructions of ARM7TDMI. Illustrate with an example. Assume that data is stored in little endian format.

 i. LDRSH R0, [R1, # - 02]!

 ii. STR R10, [R0], R1 *(04)*

5C. Write ARM7TDMI instructions to

 i. Subtract a '96' bit number available in registers 'R0' ,'R1' and 'R2' from another '96' bit number available in registers 'R3', 'R4' and 'R5'. Store the result in registers 'R6', 'R7' and 'R8'.
 ii. Multiply a '32' bit number available in memory locations 0x00006000 – 6003 by 40. Do not use any instruction for multiplication. *(03)*