21st June, 2001

# Microprocessor Systems

## Final Exam

1- Calculate the value of A (Accumulator) by using hexadecimal number system at the end of each string of logical and arithmetic opertions listed below.

a)
```
MOV   A,#57    ;  A=(57)10
ANL   A,#0FH
INC   A        ;  A=( ? )16
```

b)
```
      MOV   A,#11001100B  ; A=(11001100)2
      MOV   R0,#3         ; R0=(3)10
LOOP: INC   A
      RL    A
      DJNZ  R0,LOOP
                          ; A=( ? )16
```

c)
```
MOV   A,#35H        ; A=(35)16
MOV   R0,#37H       ; R0=(37)16
SUB   A,#30H
MOV   B,#10         ; B=(10)10
MUL   AB
ANL   R0,#00001111B
ADD   A,R0          ; A=( ? )16
```

2- An 8 bit CPU having 64Kbytes addressing capability will be connected to a memory block containing 1 piece of 27C128 EPROM, 1 piece of 62C128 static RAM, 1 piece of 28C64 EEPROM , 1 piece of 74HC573 (8 bits single directional latch) and an address decoder unit. 74HC573 will be used to drive four relays and 4 LEDs. Latch IC's sink current is high enough to drive LEDs directly and relays will be sourced from an additional independent 12V power supply. LEDs' anode-cathode voltage drop will be considered as 1.2V and the rated current is 5mA. hFE of the NPN transistor will be considered as 800 and the $V_{CEsat}$=0.3V (to drive relays). EPROM will contain the program memory and the initial address after the reset indicates first address of this device (0000H)

a) Draw the memory-addressing map of the described system.

b) Draw the circuit schema of the system using 74LS138 as the decoder IC. (Value of the resistors must be calculated at the output interface stage)

3- 3 buttons named b1, b2, and b3 will be connected to P1 and 2 relays named RL1 and RL2 will be connected P0 of a microcontroller from 8051 family. Relays must not be activated during reset and the default reset value of the each port pin is logical 1. Buttons must be tied such that they will drive the connected pin down to logical 0 when they are pressed. Relays will be sourced with the same voltage source of the microcontroller.

a) Draw the circuit schema respecting to above explanation.

b) Write the assembly code list satisfying the conditions listed below.
   If b1 is pressed and **RL2 is not acitvated** then RL1 will activate
   If b2 is pressed and **RL1 is not acitvated** then RL2 will activate
   If b3 is pressed then both of the relays will switch off as reset.

**GOOD LUCK**