

Microprocessor Systems Final Exam

22nd May, 2002

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

a)

```
MOV    A,#0H        ; A=(0)16
MOV    R0,#49D       ; R0=(49)10
LOOP:  CLR    C
       SUBB   A,R0
       DJNZ   R0,LOOP
       ORL    A,#11001001B ; A=( ? )16
```

b)

```
MOV    A,#03H        ; A=(03)16
MOV    R0,#6D         ; R0=(6)10
LOOP:  RL     A
       DJNZ   R0,LOOP
       ANL    A,#00111111B ; 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 62C64 static RAM, 1 piece of 28C16 EEPROM, 2 pieces of 74HC573 (8 bits single directional latch) and an address decoder unit. Each 74HC573 will be used to drive a 7 segments+dot type LED display (a b c d e f g Dp). Segment voltage drop and current of LEDs are $V_{AC}=1.2V$, $I_A=6mA$. ($V_{Lmax}=0.1V$ can be considered in sinking mode). Reset vector assigns PC=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. ($hFE=500$, $V_{BE}=0.7$, $V_{CEsat}=0.1V$, $I_R=100mA @ 5V$)

- a) Draw the circuit schema respecting to above explanation calculate the components features.
b) Write the assembly code list satisfying the conditions listed below.
A counter will increment If b1 is pressed while it is unpressed;
The same counter will decrement when ever b2 is pressed while it is unpressed and counter value $\neq 0$;
If counter value = 1 or 2 then RL1 will be activated and RL2 will not be energized;
If counter value > 3 then RL2 will activate and RL1 will not be energized;
If b3 is pressed then both of the relays will be switched off as reset and the counter value will be reset to 0.