23rd May, 2005

Microprocessor Systems
Final Exam

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,#50D
        MOV   R0,A
LOOP:   ADD   A,R0
        DJNZ  R0,LOOP
```
$A=(\ ?\ )_{16}$

b)
```
        MOV   30H,#0FH
        MOV   R0,#2FH
        XRL   30H,#0D0H
        INC   R0
        MOV   A,@R0
```
$A=(\ ?\ )_{16}$

2- 12MHz crystal is connected to a 89C52 microcontroller (8x51 family member). Write a program that generates 80Hz (%50Duty cycle) periodic signal at the port pin P1.0. Crystal frequency division rate of the microcontroller is 1/12 and interrupt address of the Timer 0 is 0BH. (Main program loop must be independent from 80Hz signal generation)

3- An 8 bit CPU having 64KBytes addressing capability will be connected to a memory block that is consisting of 1 piece of 27C256 EPROM, 1 piece of 62C64 static RAM, **2** pieces of 74HC573 (8 bits single directional latch) and an address decoder unit. 4 relays and **4** pieces of seven segments+deep point type, common cathode LED display will be driven through the outputs of the 74HC573. Relays will be driven through NPN transistors. Reset vector assigns ProgramCounter=0000H.

a) Draw the memory-addressing map of the described system and related logical chip selection table for the decoder.
b) Draw the circuit schema of the system using 74HC138 as the decoder IC. (Value of the components may not be calculated)
c) Components' electrical parameters are given as,
LED Display: I_{AC}=8mA/segment (static), V_{AC}=1.2V
NPN transistor: hFE=400, V_{BE}=0.7, V_{CEsat}=0.2V
PNP transistor: hFE=200, V_{BE}=0.7, V_{CEsat}=0.3V
Relay : $I_R \cong$100mA @ 5V
74HC573 : V_{Lmax}=0.5V, V_{Hmin}=4.5V, I_{max}=10mA
Calculate the required resistor values for driving the relays and the display @70Hz.

P: 1-a) 15P b)10P 2- 25P 3- a) 15P b) 25P c)15P
D: 95minutes