Σχολή Ηλεκτρολόγων Μηχανικών και Μηχανικών Υπολογιστών
Ακαδημαϊκό Έτος 2020-2021

Εξάμηνο 7ο

Εργαστήριο Μικροϋπολογιστών

1η Εργαστηριακή Αναφορά

Κωστάκη Χριστίνα (el18136)
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1η Άσκηση

```
IN 10H

LXI B,03E8H       ;1s delay
MVI D,00H         ;clock counter

START:
LDA 2000H         ;input
PUSH PSW
ANI 0FH           ;4LSB
MOV E,A           ;storing input in E
POP PSW
ANI 80H           ;MSB check
CPI 80H           ;if MSB is set, start counting up
JZ COUNTUP        ;else continue checking
JMP START

COUNTUP:
LDA 2000H         ;MSB check
ANI 80H
CPI 80H
JNZ STOPUP
CALL DELB         ;delay 1s
MOV A,D
CMP E             ;compare counter D to limit E
JZ COUNTDOWN      ;if equal, start counting down
CMA               ;LEDs implemented with reverse logic
STA 3000H         ;output
INR D             ;counter increment and repeat
JMP COUNTUP

COUNTDOWN:
LDA 2000H         ;MSB check
ANI 80H
CPI 80H
JNZ STOPDOWN
CALL DELB
MOV A,D
CPI 00H           ;compare counter D to zero
JZ START          ;if equal, check for new input
CMA
STA 3000H
DCR D             ;counter decrement and repeat
JMP COUNTDOWN
```

```
STOPUP:           ;loop for MSB check
LDA 2000H
ANI 80H
CPI 80H
JNZ STOPUP
JMP COUNTUP

STOPDOWN:         ;loop for MSB check
LDA 2000H
ANI 80H
CPI 80H
JNZ STOPDOWN
JMP COUNTDOWN

END
```

2η Άσκηση

```
IN 10H

START:
MVI A,10H   ;screen switch-off
STA 0900H
STA 0901H
STA 0902H
STA 0903H
STA 0904H
STA 0905H

CALL KIND   ;reading X
RLC
RLC
RLC
RLC         ;mul x16
MOV B,A     ;storing decades in B
CALL KIND   ;reading Y
ADD B       ;A stores the number in hex
CALL DECA
LXI D,0900H ;initial address for STDM
CALL STDM   ;printing XY in dec on display
CALL DCD
JMP START

DECA:       ;converting data of A hex->dec and storing it to memory
```

```
PUSH H
PUSH D
MVI D,FFH   ;initiating counter

HUN:        ;hundred's counter
INR D
SUI 64H     ;XY - 100
JNC HUN     ;while (XY-100)>0, increase D
ADI 64H     ;re-adding to get decades
LXI H,0902H ;storing hundreds in the address of the 3rd LSB
MOV M,D
MVI D,FFH   ;re-initiating counter

DEC:        ;decade's counter
INR D
SUI 0AH     ;XY - 10
JNC DEC     ;while (XY-10)>0, increase D
ADI 0AH     ;re-adding to get units
LXI H,0901H ;storing decades in the address of the 2nd LSB
MOV M,D
STA 0900H   ;storing units in the address of the 1st LSB
POP D
POP H
RET

END
```

3η Άσκηση

```
IN 10H

LXI B,01F4H ;0.5s Delay
MVI D,01H   ;train at LSB
MOV A,D     ;counter D
CMA         ;reverse logic of LEDs
STA 3000H

START:
LDA 2000H   ;check for MSB
MOV E,A
ANI 80H
CPI 80H
JNZ START   ;if MSB is set, check LSB for direction
MOV A,E
ANI 01H
```

```
CPI 01H
JNZ START   ;if LSB is unset, move left
JMP STARTL

STARTL:
CALL DELB   ;extra 0.5s delay at LSB
GOLEFT:
LDA 2000H   ;check for MSB
MOV E,A
ANI 80H
CPI 80H
JNZ GOLEFT
MOV A,E
ANI 01H     ;check for LSB
CPI 01H
JNZ GOR
MOV A,D
CPI 80H
JZ STARTR   ;if the train reaches the MSB, change direction
RLC         ;else keep moving left
MOV D,A
CMA
STA 3000H   ;LED on
CALL DELB
JMP GOLEFT

STARTR:
CALL DELB   ;extra 0.5s delay at MSB
GORIGHT:
LDA 2000H   ;check for MSB
MOV E,A
ANI 80H
CPI 80H
JNZ GORIGHT
MOV A,E
ANI 01H     ;check for LSB
CPI 01H
JNZ GOL
MOV A,D
CPI 01H
JZ STARTL   ;if the train reaches the LSB, change direction
RRC         ;else keep moving right
MOV D,A
CMA
STA 3000H   ;LED on
CALL DELB
```

```
JMP GORIGHT

GOL:        ;loop for LSB check
LDA 2000H
ANI 01H
CPI 01H
JZ STARTL   ;if LSB is set again, move left
JMP GOL

GOR:        ;loop for LSB check
LDA 2000H
ANI 01H
CPI 01H
JZ STARTR   ;if LSB is set again, move right
JMP GOR

END
```