Εργαστήριο Μικροϋπολογιστών

1 η Εργαστηριακή Άσκηση

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1)

```
LXI B,03E8H          ;1000 dekadiko epi 1ms
INIT: LDA 2000H
ANI 0FH              ;Apomonwsh 4LSB
MOV E,A              ;kai apothikeush tous ston E
MVI A,00H


UP: CMA              ;Anastrofh (led antistrofhs logikhs)
STA 3000H
CMA
MOV D,A              ;Apothikeush xronometrou


STOP1: LDA 2000H
RAL
JNC STOP1            ;An to MSB den einai sto 1 kolla


MOV A,D              ;An to xronometro eftase sthn timh pou ypodeiknyoyn
CMP E                ;ta 4 LSB tvn diakoptwn xekina thn antistrofh metrhsh
JZ DOWN


CALL DELB            ;Alliws perimene 1 sec kai auxhse ton metrhth
INR A                ;twn deuteroleptwn kata 1
JMP UP


DOWN: CMA            ;Gia thn katw metrhsh apeikonise pali thn timh tou
STA 3000H            ;xronometrou
CMA
MOV D,A


STOP2: LDA 2000H     ;Elegxe an MSB sto 1 alliws stamata
RAL
JNC STOP2


MOV A,D              ; Elegxe an mhdenise to xronometro wste na arxisei pali
CPI 00H              ; metrhsh anw
JZ INIT


CALL DELB            ; Alliws perimene 1 sec kai meiwse ton metrhth
DCR A                ; twn deuteroleptwn kata 1
JMP DOWN


END
```

2)

```
IN 10H                    ; Xekleidwma mnhmhs gia apothikeush timwn gia to 7-segment
MVI A,10H                 ;KENO STA 3 MSB
STA 0B05H
STA 0B04H
STA 0B03H
START: LXI D,0B00H   ;Sto zeugos DE h dieuthynsh apo thn opoia
                          ; xekinoun oi theseis mnhmhs gia thn STDM. Thn topothetoume
                          ;sto zeugos se kathe loop giati h STDM ephrreazei thn timh
                          ;zeugos DE


CALL KIND                 ;Anagnwsh apo plhktrologio
RAL
RAL
RAL
RAL                       ; Pollaplasiasmos arithmou pou diavasthke epi 16
MOV B,A                   ; Apothikeush ston B
CALL KIND                 ; Anagnwsh epomenou arithmou
ADD B                     ; Athroisma 16x+y ston A

MVI C,00H                 ; Ston C oi ekatontades

EKATONTADES: SUI 64H ; Diadoxikes afaireseis tou 100
INR C                     ; kai metrhsh ekatontadwn
JNC EKATONTADES           ; mexri na ginei arnhtikos
DCR C
ADI 64H                   ; Diorthwsh

MOV H,A                   ;SAVE PROSWRINA TON A pou periexei dekades kai monades
MOV A,C                   ;KANW MOVE EKATONTADES APO C STON A
STA 0B02H                 ;Apothikeusi tous sth thesh mnhmhs - 3o pshfio 7-segment
MOV A,H

MVI C,00H                 ; Ston C oi dekades
DEKADES: SUI 0AH     ; Allepallhles afaireseis tou 10
INR C                     ; kai metrhsh dekadwn
JNC DEKADES               ; ews otou o arithmos na ginei arnhtikos
DCR C                     ; diorthwnoume
ADI 0AH                   ; Twra o C exei tis dekades kai o A tis monades

STA 0B00H                 ; Topothetoume stis katallhles theseis mnhmhs gia STDM
MOV A,C
STA 0B01H
```

```
CALL STDM
CALL DCD              ; Apeikonish sto 7-segment display
JMP START             ;LOOP sthn arxh wste na mporoun na dwthoun neoi arithmoi

END
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3)Η κατεύθυνση του βαγονέτου αλλάζει οταν φτάσει σε κάποιο άκρο(δεξιά και αριστερά) ή μόλις το LSB από 1 γίνει 0.

```
LXI B,01F4H           ;500 dekadiko * 1ms = 0.5s
MVI D,01H             ; To vagoni arxika sthn aristerh thesi
MVI E,00H             ; Flag gia allagh kateythinsis

MOV A,D               ;Ektypwsh arxikhs theshs vagoniou
CMA
OUT 30H
CMA
CALL DELB

LEFT: IN 20H          ;An to LSB einai 1 kane to flag 0 prin synexiseis
RAR                   ; wste na allaxeis kateuthynsh mono otan tha ginei off.
JC CHANGEFLAGLEFT
RETURNLEFT: IN 20H    ; An to MSB einai off stamata to vagoni mexri
RAL                   ; na xanaginei on
JNC RETURNLEFT
MOV A,D
CPI 80H               ; An to vagoni exei ftasei sthn akrh perimene allo miso
JZ DELAYLEFT          ; sec kai ystera steilto pros ta dexia
IN 20H                ; An to LSB einai off elegxe an prin htan on kai an nai
RAR                   ; allaxe kateuthynsh sto vagoni
JNC CHECKLEFT
CONTLEFT: MOV A,D     ; Alliws vale th thesi tou vagoniou ston A
RLC                   ; kai metakinhse to aristera
CMA
OUT 30H
CMA
MOV D,A
CALL DELB             ; to vagoni menei gia 0.5s
JMP LEFT

RIGHT: IN 20H         ; Symmetrika me LEFT
RAR
JC CHANGEFLAGRIGHT
RETURNRIGHT: IN 20H
RAL
JNC RETURNRIGHT
```

```
MOV A,D
CPI 01H
JZ DELAYRIGHT
IN 20H
RAR
JNC CHECKRIGHT
CONTRIGHT: MOV A,D
RRC
CMA
OUT 30H
CMA
MOV D,A
CALL DELB
JMP RIGHT

CHECKLEFT: MOV H,A  ; Proswrinh apothikeush theshs vagoniou
MOV A,E             ; An to flag den einai 0 den allazei h kateuthynsh
CPI 00H
MOV A,H
JNZ CONTLEFT
MVI E,01H           ; Alliws to flag ginetai 1 kai allazei h kateuthynsh
JMP RIGHT

CHECKRIGHT: MOV H,A ; Omoia me CKECKLEFT
MOV A,E
CPI 00H
MOV A,H
JNZ CONTRIGHT
MVI E,01H
JMP LEFT

CHANGEFLAGLEFT: MVI E,00H ; Enhmerwsh tou flag se 0 afou o LSB
JMP RETURNLEFT       ; diakopths epanaferthike sto 1

CHANGEFLAGRIGHT: MVI E,00H ; Omoia me CHANGEFLAGLEFT
JMP RETURNRIGHT

DELAYLEFT: CALL DELB
JMP RIGHT

DELAYRIGHT: CALL DELB
JMP LEFT
END
```