



## ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ

ΣΧΟΛΗ ΗΜ&ΜΥ

Εργαστήριο Μικροϋπολογιστών 1<sup>η</sup> Εργαστηριακή Άσκηση  
Ακ. έτος 2011-2012

Ομάδα C07

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30 Νοεμβρίου 2011

## Άσκηση 1.ii

Χρονόμετρο δευτερολέπτων

```
1  START:
2      CALL BEEP
3      LXI B,03E8H
4      MVI A,FEH
5  LOOPA:
6      STA 3000H
7      CALL DELB
8      CPI FOH
9      JZ START
10     DCR A
11     JMP LOOPA
12  END
13
14
```

## Άσκηση 2.i

```
1  START:
2      LDA 2000H
3      MOV D,A
4      RRC
5      RRC
6      RRC
7      RRC
8      ANI OFH
9      MOV E,A
10     ;E has MSB needed for ANAMMA
11     MOV A,D
12     ANI OFH
13     MOV D,A
14     ;D has LSB needed for SBHSIMO
15     CALL ANAMMA
16     CALL SBHSIMO
17     JMP START
18  ANAMMA:
19     LXI B,0000H
20     LXI H,0000H
21     MOV C,E
22     CALL SHIFTBC
23     CALL SHIFTBC
24     DAD B
25     CALL SHIFTBC
26     CALL SHIFTBC
27     CALL SHIFTBC
28     DAD B
29     CALL SHIFTBC
30     DAD B
31     LXI B,00C8H
32     DAD B ;HL has the needed delay
33     MOV C,L
34     MOV B,H
35     ;need to turn on the led(s)
36     CALL ONN
37     CALL DELB
38     RET
39
40  SBHSIMO:
41     LXI B,0000H
42     LXI H,0000H
43     MOV C,D
44     CALL SHIFTBC
45     CALL SHIFTBC
46     DAD B
47     CALL SHIFTBC
48     CALL SHIFTBC
49     CALL SHIFTBC
50     DAD B
51     CALL SHIFTBC
```

```

52     DAD B
53     LXI B,00C8H
54     DAD B ;HL has the needed delay
55     MOV C,L
56     MOV B,H
57     ;need to turn on the led(s)
58     CALL OFF
59     CALL DELB
60     RET
61     SHIFTC: ;shifts BC a bit to the left :)
62     MOV A,C
63     RAL
64     CC ROTC
65     CNC ROTNC
66     RET
67
68     ROTNC:
69     MOV C,A
70     MOV A,B
71     RLC
72     MOV B,A
73     RET
74     ROTC:
75     MOV C,A
76     MOV A,B
77     RLC
78     MOV B,A
79     INR B
80     RET
81     ONN:
82     MVI A,00H
83     STA 3000H
84     RET
85     OFF:
86     MVI A,FFH
87     STA 3000H
88     RET
89
90
91     END

```

## Άσκηση 2.ii\_α

```

1     START1:
2         MVI E,00H
3         MVI D,00H
4     START:
5         CALL SHOW_COUNTERS
6         CALL CHECK_INPT
7         CALL MDELAY
8         CALL INC_COUNT
9         CALL SHOW_COUNTERS
10        JMP START
11
12     CHECK_INPT:
13         LDA 2000H
14         RAL
15         CC DIAKOPH
16         RET
17
18     SHOW_COUNTERS:
19         MOV A,D
20         RAL
21         RAL
22         RAL
23         RAL
24         CC MHDENISMOS
25         ADD E
26         CMA
27         STA 3000H
28         RET
29
30     MDELAY:
31         CALL MINI_DELAY
32         CALL CHECK_INPT

```

```

33         CALL MINI_DELAY
34         CALL CHECK_INPT
35         RET
36
37 MINI_DELAY:
38         DI
39         LXI B,0032H
40         CALL DELB ;xwris push kai pop. blepe sel 235
41         RET
42
43 INC_COUNT:
44         MOV A,E
45         INR A
46         ANI OFH
47         MOV E,A
48         RET
49
50 INC_INTR:
51         MOV A,D
52         INR A
53         ANI OFH
54         MOV D,A
55         RET
56
57 DIAKOPH:
58         MVI A,ODH
59         SIM
60         EI
61         RET
62
63 INTR_ROUTINE:
64         CALL MINI_DELAY ;perimene na sta8eropoih8ei to
65         PUSH PSW ;60 bit ths maskas sto 1
66         PUSH B
67         PUSH D
68         PUSH H
69         CALL BEEP ;tous epirreazei olous
70         POP H
71         POP D
72         POP B
73         POP PSW
74 LP:
75         RIM
76         RAL
77         RAL
78         JC LP ;perimene na mhdenistei to 60 bit ths maskas
79         CALL MINI_DELAY ;perimene na sta8eropoih8ei
80         CALL INC_INTR ;aukshse to metrhth tun diakopun
81         EI ;ksanaenergopoihse tis diakopes
82         RET
83
84 MHDENISMOS:
85         CMC
86         RET
87 END

```

## Άσκηση 2.ii\_β

```

1  START1:
2      MVI E,00H
3  START:
4      CALL SHOW_COUNTERS
5      CALL CHECK_INPT
6      CALL MDELAY
7      CALL INC_COUNT
8      CALL SHOW_COUNTERS
9      JMP START
10
11 CHECK_INPT:
12     LDA 2000H
13     RAL
14     CC DIAKOPH
15     RET
16
17 SHOW_COUNTERS:

```

```

18     MOV A,E
19     ANI OFH
20     CMA
21     STA 3000H
22     RET
23
24 MDELAY:
25     CALL MINI_DELAY
26     CALL CHECK_INPT
27     CALL MINI_DELAY
28     CALL CHECK_INPT
29     RET
30
31 MINI_DELAY:
32     DI
33     LXI B,0032H
34     CALL DELB ;xwris push kai pop. blepe sel 235
35     RET
36
37 INC_COUNT:
38     MOV A,E
39     INR A
40     ANI OFH
41     MOV E,A
42     RET
43
44 INC_INTR:
45     MOV A,D
46     INR A
47     ANI OFH
48     MOV D,A
49     RET
50
51 DIAKOPH:
52     MVI A,ODH
53     SIM
54     EI
55     RET
56
57 INTR_ROUTINE:
58     PUSH B
59     PUSH D
60     PUSH H
61     CALL BEEP
62     POP H
63     POP D
64     POP B
65     CALL METRHMA ;metra posoi diakoptes einai on
66 LP:
67     RIM
68     RAL
69     RAL
70     JC LP ;perimene na mhdenistei to 6o bit ths maskas
71     CALL MINI_DELAY ;perimene na sta8eropoih8ei
72     EI ;ksanaenergopoihse tis diakopes
73     RET
74
75 MAX_DELAY:
76     DI
77     LXI B,03E8H
78     CALL DELB ;den epirreazei kanenan
79     RET
80
81 MHDENISMOS:
82     CMC
83     RET
84
85 AUXHSH:
86     INR L
87     RET
88
89 METRHMA:
90     LDA 2000H
91     LXI H,0000H
92

```

```

93  ARXH:
94      RAL
95      CC AUXHSH
96      RAL
97      CC AUXHSH
98      RAL
99      CC AUXHSH
100     RAL
101     CC AUXHSH
102     RAL
103     CC AUXHSH
104     RAL
105     CC AUXHSH
106     RAL
107     CC AUXHSH
108     RAL
109     CC AUXHSH
110     CC MHDENISMOS
111     MOV A,L
112     RAL
113     RAL
114     RAL
115     RAL
116     ADD E
117     CMA
118     STA 3000H ;kai deikse to a8roisma tous sta leds
119     CALL MAX_DELAY ;perimene na doume to apotelesma
120     RET
121
122  END

```