



ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ

ΣΧΟΛΗ ΗΜ&ΜΥ

Εργαστήριο Μικροϋπολογιστών 1^η Εργαστηριακή Άσκηση
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Ομάδα C07

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

```

52     CALL SHIFTBC
53     DAD B
54     LXI B,00C8H
55     DAD B ;HL has the needed delay
56     MOV C,L
57     MOV B,H
58     ;need to turn on the led(s)
59     CALL OFF
60     CALL DELB
61     RET
62     SHIFTBC: ;shifts BC a bit to the left :)
63     MOV A,C
64     RAL
65     CC ROTC
66     CNC ROTNC
67     RET
68
69     ROTNC:
70     MOV C,A
71     MOV A,B
72     RLC
73     MOV B,A
74     RET
75
76     ROTC:
77     MOV C,A
78     MOV A,B
79     RLC
80     MOV B,A
81     INR B
82     RET
83
84     ONN:
85     MVI A,00H
86     STA 3000H
87     RET
88
89     OFF:
90     MVI A,FFH
91     STA 3000H
92     RET
93
94     END

```

Άσκηση 2.ii

```

1     IN 10H
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    ADD E
25    CMA
26    STA 3000H
27    RET
28
29    MDELAY:
30    CALL MINI_DELAY
31    CALL CHECK_INPT
32    CALL MINI_DELAY

```

```

32         CALL CHECK_INPT
33         RET
34
35     MINI_DELAY:
36         DI
37         LXI B,0032H
38         CALL DELB ;xwris push kai pop. blepe sel 235
39         RET
40
41     INC_COUNT:
42         MOV A,E
43         INR A
44         ANI OFH
45         MOV E,A
46         RET
47
48     INC_INTR:
49         MOV A,D
50         INR A
51         ANI OFH
52         MOV D,A
53         RET
54
55     DIAKOPH:
56         MVI A,ODH
57         SIM
58         EI
59         RET
60
61     INTR_ROUTINE:
62         CALL MINI_DELAY ;perimene na sta8eropoih8ei to
63         PUSH PSW          ;60 bit ths maskas sto 1
64         PUSH B
65         PUSH D
66         PUSH H
67         CALL BEEP ;tous epirreazei olous
68         POP H
69         POP D
70         POP B
71         POP PSW
72     LP:    RIM
73         RAL
74         RAL
75         JC LP ;perimene na mhdenistei to 60 bit ths maskas
76         CALL MINI_DELAY ;perimene na sta8eropoih8ei
77         CALL INC_INTR   ;aukshse to metrhth twm diakopwn
78         CALL METRHMA    ;metra posoi diakoptes einai on
79         EI              ;ksanaenergopoihse tis diakopes
80         RET
81
82     MAX_DELAY:
83         DI
84         LXI B,03E8H
85         CALL DELB ;den epirreazei kanenan
86
87     AUXHSH:
88         INR L
89         RET
90
91     METRHMA:
92         LDA 2000H
93         LXI H,0000H
94     ARXH:
95         RAL
96         CC AUXHSH
97         RAL
98         CC AUXHSH
99         RAL
100        CC AUXHSH
101        RAL
102        CC AUXHSH
103        RAL
104        CC AUXHSH
105        RAL
106        CC AUXHSH

```

```
107      RAL
108      CC AUXHSH
109      RAL
110      CC AUXHSH
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      MOV L,A
121      RET
122  END
```