



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
3     MVI E,00H
4     MVI D,00H
5
6     START:
7     CALL CHECK_INPT
8     CALL MDELAY
9     CALL SHOW_COUNTERS
10    CALL INC_COUNT
11    CALL SHOW_COUNTERS
12    JMP START
13
14    CHECK_INPT:
15    LDA 2000H
16    RAL
17    CC DIAKOPH
18    RET
19
20    SHOW_COUNTERS:
21    MOV A,D
22    RAL
23    RAL
24    RAL
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

```

```

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     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      MOV A,L
111      RAL
112      RAL
113      RAL
114      RAL
115      ADD E
116      CMA
117      STA 3000H ;kai deikse to a8roisma tous sta leds
118      CALL MAX_DELAY ;perimene na doume to apotelesma
119      MOV L,A
120      RET
121  END
```