



ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ

ΣΧΟΛΗ ΗΜ&ΜΥ

Εργαστήριο Μικροϋπολογιστών 1^η Εργαστηριακή Άσκηση
Ακ. έτος 2011-2012

Ομάδα C07

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27 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
```

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 0FH
10     MOV E,A
11     ;E has MSB needed for ANAMMA
12     MOV A,D
13     ANI 0FH
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  ROTC:
76      MOV C,A
77      MOV A,B
78      RLC
79      MOV B,A
80      INR B
81      RET
82  ONN:
83      MVI A,00H
84      STA 3000H
85      RET
86  OFF:
87      MVI A,FFH
88      STA 3000H
89      RET
90
91
92  END

```

Άσκηση 2.ii

```

1  IN 10H
2      MVI E,00H
3      MVI D,00H
4  START:
5      CALL CHECK_INPT
6      CALL MDELAY
7      CALL SHOW_COUNTERS
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  MDELAY:
29     CALL MINI_DELAY
30     CALL CHECK_INPT
31     CALL MINI_DELAY
32     CALL CHECK_INPT
33     RET

```

```

34
35  MINI_DELAY:
36      DI
37      LXI B,0032H
38      PUSH B
39      PUSH D
40      CALL DELB
41      POP D
42      POP B
43      RET
44
45  INC_COUNT:
46      MOV A,E
47      INR A
48      ANI 0FH
49      MOV E,A
50      RET
51
52  INC_INTR:
53      MVI H,00H
54      MOV A,D
55      INR A
56      ANI 0FH
57      MOV D,A
58      RET
59
60  DIAKOPH:
61      MVI A,0DH
62      SIM
63      EI
64      RET
65
66  INTR_ROUTINE:
67      PUSH B
68      PUSH D
69      PUSH H
70      CALL BEEP
71      POP H
72      POP D
73      POP B
74      CALL MINI_DELAY
75  LP:   RIM
76      RAL
77      RAL
78      JC LP
79      INR H
80      MOV A,H
81      CPI 02H
82      MOV H,A
83      JZ INC_INTR
84      CALL SHOW_COUNTERS
85      EI
86      CALL MINI_DELAY
87      MVI L,00H
88      CALL METRHMA
89      RET
90
91  MAX_DELAY:
92      DI
93      LXI B,03E8H
94      PUSH H
95      PUSH B
96      PUSH D
97      CALL DELB
98      POP D
99      POP B
100     POP H
101
102  AUXHSH:
103     INR L
104     RET
105
106  METRHMA:
107     LDA 2000H
108  ARXH:

```

```
109      RAL
110      CC AUXHSH
111      RAL
112      CC AUXHSH
113      RAL
114      CC AUXHSH
115      RAL
116      CC AUXHSH
117      RAL
118      CC AUXHSH
119      RAL
120      CC AUXHSH
121      RAL
122      CC AUXHSH
123      RAL
124      CC AUXHSH
125      MOV A,L
126      RAL
127      RAL
128      RAL
129      RAL
130      ADD E
131      CMA
132      STA 3000H
133      CALL MAX_DELAY
134      MOV L,A
135      EI
136      RET
137  END
```