ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ

ΣΧΟΛΗ ΗΜ&ΜΥ
Εργαστήριο Μικροϋπολογιστών 1$^\eta$ 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 F0H
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 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

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

45  INC_COUNT:
46          MOV A,E
47          INR A
48          ANI 0FH
49          MOV E,A
50          RET

52  INC_INTR:
53          MVI H,00H
54          MOV A,D
55          INR A
56          ANI 0FH
57          MOV D,A
58          RET

60  DIAKOPH:
61          MVI A,0DH
62          SIM
63          EI
64          RET

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

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

102 AUXHSH:
103         INR L
104         RET

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
```