



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
```

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 ;HL has the needed delay
31     MOV C,L
32     MOV B,H
33     ;need to turn on the led(s)
34     CALL ONN
35     CALL DELB
36     RET
37
38  SBHSIMO:
39     LXI B,0000H
40     LXI H,0000H
41     MOV C,D
42     CALL SHIFTBC
43     CALL SHIFTBC
44     DAD B
45     CALL SHIFTBC
46     CALL SHIFTBC
47     CALL SHIFTBC
48     DAD B
49     CALL SHIFTBC
50     DAD B ;HL has the needed delay
51     MOV C,L
52     MOV B,H
53     ;need to turn on the led(s)
```

```

54         CALL OFF
55         CALL DELB
56         RET
57  SHIFTBC: ;shifts BC a bit to the left :)
58         MOV A,C
59         RAL
60         CC ROTC
61         CNC ROTNC
62         RET
63
64  ROTNC:
65         MOV C,A
66         MOV A,B
67         RLC
68         MOV B,A
69         RET
70  ROTC:
71         MOV C,A
72         MOV A,B
73         RLC
74         MOV B,A
75         INR B
76         RET
77  ONN:
78         MVI A,00H
79         STA 3000H
80         RET
81  OFF:
82         MVI A,FFH
83         STA 3000H
84         RET
85
86
87  END

```

Άσκηση 2.ii

```

1  START:
2         CALL CHECK_INPT
3         CALL MDELAY
4         CALL INC_COUNT
5         CALL SHOW_COUNTERS
6         JMP START
7
8  CHECK_INPT:
9         LDA 2000H
10        RAL
11        CC DIAKOPH
12        RET
13
14  SHOW_COUNTERS:
15        MOV A,D
16        RAL
17        RAL
18        RAL
19        RAL
20        ADD E
21        CMA
22        STA 3000H
23        RET
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
35        RET
36
37  INC_COUNT:
38        MOV A,E

```

```

39         INR A
40         ANI OFH
41         MOV E,A
42         RET
43 INC_INTR:
44         MOV A,D
45         INR A
46         ANI OFH
47         MOV D,A
48         RET
49
50 DIAKOPH:
51         MVI A,ODH
52         SIM
53         EI
54         RET
55
56 INTR_ROUTINE:
57         PUSH B
58         PUSH D
59         CALL BEEP
60         POP D
61         POP B
62         CALL MINI_DELAY
63 LP:      RIM
64         RAL
65         RAL
66         JC LP
67         CALL MINI_DELAY
68         CALL INC_INTR
69         EI
70         RET
71 END

```