

ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ

ΣΧΟΛΗ ΗΜ&ΜΥ Εργαστήριο Μικροϋπολογιστών 1^η Εργαστηριακή Άσκηση Ακ. έτος 2011-2012

Ομάδα C07

Ασκηση 1.ii

Χρονόμετρο δευτερολέπτων

```
START:
            CALL BEEP
2
            LXI B,03E8H
            MVI A, FEH
    LOOPA:
            STA 3000H
            CALL DELB
            CPI FOH
            JZ START
            DCR A
10
            JMP LOOPA
11
    END
12
13
14
```

Ασκηση 2.i

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

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

Άσκηση 2.ii_α

```
START1:
             MVI E,00H
2
             MVI D,00H
    START:
             CALL SHOW_COUNTERS
             CALL CHECK_INPT
             CALL MDELAY
             CALL INC_COUNT
CALL SHOW_COUNTERS
             JMP START
10
11
    CHECK_INPT:
12
             LDA 2000H
13
             RAL
14
15
             CC DIAKOPH
             RET
16
17
    SHOW_COUNTERS:
18
             MOV A,D
19
             RAL
21
             RAL
             RAL
22
23
             RAL
             CC MHDENISMOS
24
             ADD E
25
             CMA
26
             STA 3000H
27
28
             RET
29
    MDELAY:
             CALL MINI_DELAY
```

```
CALL CHECK_INPT
32
             CALL MINI_DELAY
33
             CALL CHECK_INPT
34
35
             RET
36
37
    MINI_DELAY:
38
             LXI B,0032H
39
             CALL DELB ; xwris push kai pop. blepe sel 235
40
             RET
41
42
    INC_COUNT:
43
             MOV A,E
44
45
             INR A
             ANI OFH
46
             MOV E,A
47
48
             RET
49
    INC_INTR:
51
             MOV A,D
             INR A
52
53
             ANI OFH
54
             MOV D,A
             RET
55
56
    DIAKOPH:
57
             MVI A,ODH
58
59
             SIM
             ΕI
60
             RET
61
62
    INTR_ROUTINE:
63
64
             CALL MINI_DELAY ;perimene na sta8eropoih8ei to
             PUSH PSW ;60 bit ths maskas sto 1
65
             PUSH B
67
             PUSH D
             PUSH H
68
             CALL BEEP ; tous epirreazei olous
70
             POP H
71
             POP D
72
             POP B
             POP PSW
73
    LP:
74
75
             RIM
             RAL
76
             RAL
77
             JC LP ;perimene na mhdenistei to 60 bit ths maskas
78
             {\tt CALL\ MINI\_DELAY\ ; perimene\ na\ sta8eropoih8ei}
79
80
             {\tt CALL\ INC\_INTR\ }; aukshse\ to\ metrhth\ twn\ diakopwn
             EI ;ksanaenergopoihse tis diakopes
81
             RET
82
83
    MHDENISMOS:
84
85
             CMC
             RET
86
    END
87
    Άσκηση 2.ii_β
    START1:
1
             MVI E,00H
    START:
3
             CALL SHOW_COUNTERS
             CALL CHECK_INPT
             CALL MDELAY
             CALL INC_COUNT
             CALL SHOW_COUNTERS
             JMP START
10
    CHECK_INPT:
11
             LDA 2000H
12
             RAL
13
             CC DIAKOPH
14
             RET
15
```

16

```
SHOW_COUNTERS:
17
             MOV A,E
18
             ANI OFH
19
20
             CMA
             STA 3000H
21
             RET
23
    MDELAY:
24
             CALL MINI_DELAY
25
             CALL CHECK_INPT
26
             CALL MINI_DELAY
27
             CALL CHECK_INPT
28
             RET
29
    MINI_DELAY:
31
             DI
32
33
             LXI B,0032H
             CALL DELB ; xwris push kai pop. blepe sel 235
34
             RET
35
36
    INC_COUNT:
37
             MOV A,E
39
             INR A
             ANI OFH
40
41
             MOV E,A
             RET
42
43
44
    INC_INTR:
             MOV A,D
45
46
             INR A
             ANI OFH
47
             MOV D,A
48
49
             RET
50
    DIAKOPH:
51
             MVI A,ODH
52
             SIM
53
54
             ΕI
55
             RET
56
    INTR_ROUTINE:
57
             PUSH B
58
             PUSH D
59
             PUSH H
             CALL BEEP
61
             POP H
62
             POP D
63
             POP B
64
65
             CALL METRHMA ; metra posoi diakoptes einai on
    LP:
66
67
             RIM
68
             RAL
             RAL
69
             JC LP ;perimene na mhdenistei to 60 bit ths maskas
70
71
             CALL MINI_DELAY ;perimene na sta8eropoih8ei
             EI ;ksanaenergopoihse tis diakopes
72
73
             RET
74
    MAX_DELAY:
75
             DI
77
             LXI B,03E8H
             CALL DELB ;den epirreazei kanenan
78
79
80
81
    MHDENISMOS:
             CMC
82
             RET
83
84
    AUXHSH:
85
             INR L
87
             RET
88
    METRHMA:
             LDA 2000H
90
             LXI H,0000H
91
```

```
92
     ARXH:
93
              RAL
CC AUXHSH
94
95
              RAL
96
              CC AUXHSH
97
98
              RAL
              CC AUXHSH
99
              RAL
100
              CC AUXHSH
101
              RAL
102
              CC AUXHSH
103
              RAL
CC AUXHSH
104
105
              RAL
106
              CC AUXHSH
107
              RAL
108
              CC AUXHSH
109
              CC MHDENISMOS
110
              MOV A,L
111
              RAL
112
              RAL
113
              RAL
114
              RAL
115
116
              ADD E
              CMA
117
              STA 3000H ;kai deikse to a8roisma tous sta leds
118
              CALL MAX_DELAY ;perimene na doume to apotelesma
119
              RET
120
121
122
     END
```