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 F0H
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 0FH
9          MOV E,A
10         ;E has MSB needed for ANAMMA
11         MOV A,D
12         ANI 0FH
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
31         LXI B,00C8H
32         DAD B ;HL has the needed delay
33         MOV C,L
34         MOV B,H
35         ;need to turn on the led(s)
36         CALL ONN
37         CALL DELB
38         RET
39
40 SBHSIMO:
41         LXI B,0000H
42         LXI H,0000H
43         MOV C,D
44         CALL SHIFTBC
45         CALL SHIFTBC
46         DAD B
47         CALL SHIFTBC
48         CALL SHIFTBC
49         CALL SHIFTBC
50         DAD B
51         CALL SHIFTBC
52         DAD B
53         LXI B,00C8H
```

```
54          DAD B ;HL has the needed delay
55          MOV C,L
56          MOV B,H
57          ;need to turn on the led(s)
58          CALL OFF
59          CALL DELB
60          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          MOV A,B
71          RLC
72          MOV B,A
73          RET
74  ROTC:
75          MOV C,A
76          MOV A,B
77          RLC
78          MOV B,A
79          INR B
80          RET
81  ONN:
82          MVI A,00H
83          STA 3000H
84          RET
85  OFF:
86          MVI A,FFH
87          STA 3000H
88          RET
89
90
91  END
```

Άσκηση 2.ii_α

```
1   START1:
2           MVI E,00H
3           MVI D,00H
4   START:
5           MOV A,D
6           RAL
7           RAL
8           RAL
9           RAL
10          JC MHDENISMOS
11  SYNEXEIA:
12          ADD E
13          CMA
14          STA 3000H
15          LXI B,0064H
16          DI
17          CALL DELB
18          LDA 2000H
19          RAL
20          JC DIAKOPH
21  SYN:
22          MOV A,E
23          INR A
24          ANI 0FH
25          MOV E,A
26          JMP START
27
28  DIAKOPH:
29          MVI A,0DH
30          SIM
31          EI
32          JMP SYN
33
34  INTR_ROUTINE:
```

```asm
35        LXI B,0032H
36        CALL DELB ;perimene na sta8eropoih8ei to
37        PUSH PSW ;6o bit ths maskas sto 1
38        PUSH B
39        PUSH D
40        PUSH H
41        CALL BEEP ;tous epireazei olous
42        POP H
43        POP D
44        POP B
45        POP PSW
46  LP:
47        RIM
48        RAL
49        RAL
50        JC LP ;perimene na mhdenistei to 6o bit ths maskas
51        CALL DELB ;perimene na sta8eropoih8ei
52        MOV A,D
53        INR A
54        ANI 0FH
55        MOV D,A ;aukshse to metrhth twn diakopwn
56        EI ;ksanaenergopoihse tis diakopes
57        RET
58
59  MHDENISMOS:
60        CMC
61        JMP SYNEXEIA
62  END
```

Άσκηση 2.ii_β

```asm
1   START1:
2         MVI E,00H
3   START:
4         MOV A,E
5         ANI 0FH
6         CMA
7         STA 3000H
8         LXI B,0064H
9         DI
10        CALL DELB
11        LDA 2000H
12        RAL
13        JC DIAKOPH
14  SYN:
15        MOV A,E
16        INR A
17        ANI 0FH
18        MOV E,A
19        JMP START
20
21  DIAKOPH:
22        MVI A,0DH
23        SIM
24        EI
25        JMP SYN
26
27  INTR_ROUTINE:
28        PUSH B
29        PUSH D
30        PUSH H
31        CALL BEEP
32        POP H
33        POP D
34        POP B
35  METRHMA: ;metra posoi diakoptes einai on
36        LDA 2000H
37        LXI H,0000H
38  ARXH:
39        RAL
40        JNC S1
41        INR L
42  S1:
43        RAL
44        JNC S2
```

```
45              INR L
46      S2:
47              RAL
48              JNC S3
49              INR L
50      S3:
51              RAL
52              JNC S4
53              INR L
54      S4:
55              RAL
56              JNC S5
57              INR L
58      S5:
59              RAL
60              JNC S6
61              INR L
62      S6:
63              RAL
64              JNC S7
65              INR L
66      S7:
67              RAL
68              JNC S8
69              INR L
70      S8:
71              JC MHDENISMOS
72      SYNEXEIA:
73              MOV A,L
74              RAL
75              RAL
76              RAL
77              RAL
78              ADD E
79              CMA
80              STA 3000H  ;kai deikse to a8roisma tous sta leds
81              LXI B,03E8H
82              CALL DELB  ;perimene na doume to apotelesma
83      LP:
84              RIM
85              RAL
86              RAL
87              JC LP ;perimene na mhdenistei to 6o bit ths maskas
88              LXI B,0032H
89              CALL DELB  ;perimene na sta8eropoih8ei
90              EI  ;ksanaenergopoihse tis diakopes
91              RET
92
93      MHDENISMOS:
94              CMC
95              JMP SYNEXEIA
96      END
```