



ΕΘΝΙΚΟ ΜΕΤΣΟΒΙΟ ΠΟΛΥΤΕΧΝΕΙΟ

ΣΧΟΛΗ ΗΜ&ΜΥ

Εργαστήριο Μικροϋπολογιστών 1^η Εργαστηριακή Άσκηση
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Ομάδα C07

Ευαγγελάτου Ελένη	A.M.: 03108050
Λύρας Γρηγόρης	A.M.: 03109687
Φραγιαδάκη Βασιλεία	A.M.: 03108026

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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)

Χρονοκαθυστέρηση στα LEDS

```
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
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     SHIFTC: ;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

Χρονόμετρο και μετρητής διακοπών

```

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:
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 twv diakopwn
56     EI ;ksanaenergopoihse tis diakopes
57     RET
58
59 MHDENISMOS:
60     CMC
61     JMP SYNEXEIA
62 END

```

Άσκηση 2(ii) β

Χρονόμετρο και μετρητής bit της θύρας εισόδου

```

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

```