

ΣΥΣΤΗΜΑΤΑ ΜΙΚΡΟΥΠΟΛΟΓΙΣΤΩΝ

ΣΕΙΡΑ ΑΣΚΗΣΕΩΝ 6

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Άσκηση 1:

```
.include "m16def.inc"
```

```
.DEF temp=r21
```

```
.DEF counter=r22
```

```
.org 0
```

```
clr temp
```

```
out DDRD,temp
```

```
ser temp
```

```
out PORTD,temp ; pull up D port
```

```
out DDRB,temp ; portb enable
```

```
checkleds:
```

```
in temp,PIND ; get input
```

```
sbrcl temp,7 ; check if msb of input is 1
```

```
jmp normal
```

```
jmp reverse
```

```
normal:
```

```
ldi temp,0b1111111
```

```
out PORTB,temp
```

```
ldi counter,50 ; 0,5 sec
```

```
loop1:
```

```
rcall Delay10
```

```
subi counter,1
```

```
BREQ loop1 ; until is zero
```

```
clr temp ;close leds
```

```
out PORTB,temp
```

```
ldi counter,150 ; timer new
```

```
loop2:
```

```
rcall Delay10
```

```
subi counter,1
```

```
BREQ loop2
```

```
jmp checkleds
```

```
reverse:
```

```
clr temp ;close leds,not needed, case of hardware failure
```

```
out PORTB,temp
```

```
ldi counter,50 ; 0,5 sec
```

```
loop11:
```

```
rcall Delay10
```

```
subi counter,1
```

```
BREQ loop11 ; until is zero
```

```
ldi temp,0b1111111 ; light leds
```

```
out PORTB,temp
```

```
ldi counter,150 ; timer new
```

```
loop12:
```

```
rcall Delay10
```

```
subi counter,1
```

```
BREQ loop12
clr temp
out PORTB,temp ; close leds
jmp checkleds
```

Άσκηση 2

```
.include "m16def.inc"
.DEF temp=r21
.DEF x0=r22
.DEF x1=r20
.DEF temp2=r19
.org 0
clr temp
out DDRC,temp
ser temp
out PORTC,temp ; pull up C port
out DDRA,temp ; porta enable for output

in temp,PINC ; take input
ldi temp2,12 ; AB
and temp2,temp
cpi temp2,12
breq Set_x0
ldi temp2,112 ; CD`E`
and temp2,temp
cpi temp2,16
breq Set_x0
jmp X1K
Set_x0:
ldi x0,1
X1K:
ldi temp2,60 ; mask ABC`D
and temp2,temp
cpi temp2,44
breq Set_x1
ldi temp2,224 ; mask D`EF`
and temp2,temp
cpi temp2,128
breq Set_x1
jmp X_2
Set_x1:
ldi x1,1
X_2:
clr temp2
add temp2,x1 ; add the numbers
add temp2,x2
sbrc temp2,2 ; check if the number is 2
dec temp2
lsl temp2
lsl temp2 ; rotate bits
lsl x1 ; now it is in the correct place
add temp2,x1
add temp2,x0 ; output ready
out PORTA,temp2
```

Άσκηση 3:

```
.include "m16def.inc"
.DEF temp=r21
.DEF zero=r22
.DEF temp2=r19
.org 0
clr temp
clr zero
out DDRD,temp
ser temp
out PORTD,temp ; pull up C port
out DDRB,temp ; porta enable for output
Start:
clr temp
ldi temp,1
out PORTB,temp
Input:
in temp2,PIND ;take SW input
cpi temp2,3 ; first action
breq F1
cpi temp2,5 ;second action etc
breq F2
cpi temp2,6
breq F3
cpi temp2,9
breq F4
cpi temp2,10
breq F5
cpi temp2,12
breq Start ;reset
cpi temp2,7 ;reset again etc
breq Start
cpi temp2,11
breq Start
cpi temp2,14
breq Start
cpi temp2,15
breq Start
jmp Input ;do it again

F1:
lsl temp
out PORTB,temp ;rotate leds
jmp Input
F2:
lsr temp
out PORTB,temp ;rotate leds
jmp Input
F3:
lsl temp
lsl temp ; rotate 2 times left
out PORTB,temp
jmp Input
F4:
lsr temp
lsr temp ;rotate 2 times right
out PORTB,temp
jmp Input
```

F5:

ldi temp,3 ; leds 0-1

out PORTB,temp

jmp Input