

# Design Assignment 0

---

DO NOT REMOVE THIS PAGE DURING SUBMISSION:

The student understands that all required components should be submitted in complete for grading of this assignment.

NO	SUBMISSION ITEM	COMPLETED (Y/N)	MARKS (/MAX)
0.	INITIAL CODE OF TASK A		
1	CALCULATION OF TASK B		
2.	SCREENSHOTS OF EACH TASK OUTPUT		

0	INITIAL CODE OF TASK A		
---	------------------------	--	--

```
;
;
; sikorsk4_DA0_CpE301_S16.asm
;
;
; Created: 2/15/2016 5:21:48 PM
; Author : jmsikorski
;
```

; Replace with your application code

```
.EQU a = 35      ; Using variables for code efficiency
.EQU b = 37
.EQU c = 42
.EQU d = 48
.EQU e = 59
```

```
SBI      DDRB, 2      ;Set Pin 2 of B register to output
LDI      R17, 0x04    ;Set register 3 to 4
SUBI     R16, -a      ;Using SUBI for speed to not have to load
BRVS     OVER;        ;If there is overflow, jump to OVER
SUBI     R16, -b      ;Using SUBI for speed to not have to load
BRVS     OVER;        ;If there is overflow, jump to OVER
SUBI     R16, -c      ;Using SUBI for speed to not have to load
BRVS     OVER;        ;If there is overflow, jump to OVER
SUBI     R16, -d      ;Using SUBI for speed to not have to load
BRVS     OVER;        ;If there is overflow, jump to OVER
SUBI     R16, -e      ;Using SUBI for speed to not have to load
BRVS     OVER;        ;If there is overflow, jump to OVER
RJMP     DONE        ;Jump to end
```

OVER:

```
OUT      PORTB, R17   ;Output pin2 high on PORTB
```

DONE:

```
RJMP     DONE        ;Loop here forever
```

1	CALCULATION OF TASK B		
---	-----------------------	--	--

Execution time is calculated at  $1.50\mu\text{S}$  for the simulated with a maximum runtime of  $1.75\mu\text{S}$ . Calculated number of cycles for the simulated code is 12 with a maximum of 14.

2.	SCREENSHOTS OF EACH TASK OUTPUT		
----	---------------------------------	--	--

### TASK 1: (Beginning of simulation)

The screenshot displays the AVR Studio interface during the initial simulation. The **Processor Status** window on the left shows the following values:

Name	Value
Program Counter	0x00000001
Stack Pointer	0x08FF
X Register	0x0000
Y Register	0x0000
Z Register	0x0000
Status Register	⓪ Ⓣ ⓗ Ⓢ Ⓥ Ⓝ Ⓩ ⓐ
Cycle Counter	1
Frequency	8.000 MHz
Stop Watch	0.13 µs

Below the status window, the **Registers** window lists registers R00 through R31, all with a value of 0x00.

The **I/O** window on the right shows a list of hardware components. **PORTB** is selected. Below this, a detailed view of PORTB is shown:

Name	Address	Value	Bits
PINB	0x23	0x00	□ □ □ □ □ □ □ □
DDRB	0x24	0x04	□ □ □ □ □ ■ □ □
PORTB	0x25	0x00	□ □ □ □ □ □ □ □

## TASK 1: (End of simulation)

The screenshot displays two windows from an IDE. The 'Processor Status' window on the left shows the state of the processor at the end of a simulation. The 'I/O' window on the right shows the state of various I/O components.

**Processor Status**

Name	Value
Program Counter	0x0000000E
Stack Pointer	0x08FF
X Register	0x0000
Y Register	0x0000
Z Register	0x0000
Status Register	0x00000000
Cycle Counter	12
Frequency	8.000 MHz
Stop Watch	1.50 µs

**Registers**

Register	Value
R00	0x00
R01	0x00
R02	0x00
R03	0x00
R04	0x00
R05	0x00
R06	0x00
R07	0x00
R08	0x00
R09	0x00
R10	0x00
R11	0x00
R12	0x00
R13	0x00
R14	0x00
R15	0x00
R16	0xA2
R17	0x04
R18	0x00
R19	0x00
R20	0x00
R21	0x00
R22	0x00
R23	0x00
R24	0x00
R25	0x00
R26	0x00
R27	0x00
R28	0x00
R29	0x00
R30	0x00
R31	0x00

**I/O**

Name	Value
AD_CONVERTER	0x00000000
ANALOG_COMPARATOR	0x00000000
CPU	0x00000000
EEPROM	0x00000000
EXTERNAL_INTERRUPT	0x00000000
PORTB	0x00000000
PORTC	0x00000000
PORTD	0x00000000
SPI	0x00000000
TIMER_COUNTER_0	0x00000000
TIMER_COUNTER_1	0x00000000
TIMER_COUNTER_2	0x00000000
TWI	0x00000000
USART0	0x00000000
WATCHDOG	0x00000000

**I/O Details**

Name	Address	Value	Bits
PINB	0x23	0x00	00000000
DDRB	0x24	0x04	00000100
PORTB	0x25	0x04	00000100

Student Academic Misconduct Policy

<http://studentconduct.unlv.edu/misconduct/policy.html>

“This assignment submission is my own, original work”.

JASON M. SIKORSKI