

Design Assignment 1B

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Primary Github address: <https://github.com/WorkuT1226/CPE301.git>

Directory:

Submit the following for all Labs:

- In the document, for each task submit the modified or included code (only) with highlights and justifications of the modifications. Also, include the comments.
- Use the previously create a Github repository with a random name (no CPE/301, Lastname, Firstname). Place all labs under the root folder ESD301/DA, sub-folder named LABXX, with one document and one video link file for each lab, place modified asm/c files named as LabXX-TYY.asm/c.
- If multiple asm/c files or other libraries are used, create a folder LabXX-TYY and place these files inside the folder.
- The folder should have a) Word document (see template), b) source code file(s) and other include files, c) text file with youtube video links (see template).

- **COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS**

List of Components used

Block diagram with pins used in the Atmega328P

- **INITIAL/MODIFIED/DEVELOPED CODE OF TASK 1/A**

```
.EQU STARTADDS = 0x0200 //set STARTADDS to 0x200
```

```
.EQU COUNTER = 250 //set counter to 250
```

```
.org 0
```

```
CLR R0 //clear R0
```

```
LDI XL, LOW(STARTADDS) //sets low bits of register X (R26)
```

```
LDI XH, HIGH(STARTADDS)//set high bits of register X (R27)
LDI YL, LOW(0x300)//set low bits of register Y(R28) to 0x300
LDI YH, HIGH(0x300)//set high bits of register Y(R29) to 0x300
LDI ZL, LOW(0x500)//set low bits of register Y(R30) to 0x500
LDI ZH, HIGH(0x500)//set high bits of register Y(R31) to 0x500
```

```
LDI R22, 6 //load immediate value 6 into R22
LDI R21, Counter //load counter value into R21
```

BEGIN:

```
MOV R23, R22 //move value in R22 to R23.
ST    X+, R22 //store value X is pointing at to R22 then increment by 1.
JMP L1 //jump to L1 target
```

L1:

```
SUBI R23, 0x05 //subtract immediate value 0x05 from value in R23
BREQ L3 //branch if equal jump to L3 target
BREQ L2 //branch if equal jump to L2 target.
JMP L1 //jump to L1 target
```

L2:

```
ST Y+, R22 //store value Y is pointing at to R22 then increment by 1.
ADD R16, R22 //add value in R22 to R16
ADC R17, R0 //add with carry value in R0 to R17
JMP END // jump to END target
```

L3:

```
ST Z+, R22 //store value Z is pointing at to R28 then increment by 1
ADD R18, R22 // add value in R28 to R18.
ADC R19, R0 //add with carry value in R0 to R19.
JMP END //jump to END target
```

END:

```
INC R22 //increment R28 by 1.
DEC R21 //decrement counter by 1
BRNE BEGIN //branch if not equal back to BEGIN target.
BREAK //break loop
```

- **DEVELOPED MODIFIED CODE OF TASK 2/A from TASK 1/A**
- **SCHEMATICS**
- **SCREENSHOTS OF EACH TASK OUTPUT (ATMEL STUDIO OUTPUT)**

```

L3:      ST Z+, R22 //store value Z is pointing at to R28 then increment by 1
        ADD R18, R22 // add value in R28 to R18.
        ADC R19, R0 //add with carry value in R0 to R19.
        JMP END //jump to END target

END:     INC R22 //increment R28 by 1.
        DEC R21 //decrement counter by 1
        BRNE BEGIN //branch if not equal back to BEGIN target.
        BREAK //break loop

```

```

Output # Assignment 1B main.asm*
.EQU STARTADD5 = 0x0200 //set STARTADD5 to 0x200
.EQU COUNTER = 250 //set counter to 250

.org 0

CLR R0 //clear R0
LDI XL, LOW(STARTADD5) //sets low bits of register X (R26)
LDI XH, HIGH(STARTADD5) //set high bits of register X (R27)

LDI YL, LOW(0x300) //set low bits of register Y(R28) to 0x300
LDI YH, HIGH(0x300) //set high bits of register Y(R29) to 0x300

LDI ZL, LOW(0x500) //set low bits of register Y(R30) to 0x500
LDI ZH, HIGH(0x500) //set high bits of register Y(R31) to 0x500

LDI R22, 6 //load immediate value 6 into R22
LDI R21, COUNTER //load counter value into R21

BEGIN:
MOV R23, R22 //move value in R22 to R23.
ST X+, R22 //store value X is pointing at to R22 then increment by 1.
JMP L1 //jump to L1 target

L1:
SUBI R23, 0x05 //subtract immediate value 0x05 from value in R23
BREQ L3 //branch if equal jump to L3 target
BREQ L2 //branch if equal jump to L2 target.
JMP L1 //jump to L1 target

L2:
ST Y+, R22 //store value Y is pointing at to R22 then increment by 1.
ADD R16, R22 //add value in R22 to R16
ADC R17, R0 //add with carry value in R0 to R17
JMP END // jump to END target

```

```

prog 0xFFCA 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
prog 0xFFDC 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
prog 0xFFEE 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
prog 0x0000 00 24 a0 e0 b2 e0 c0 e0 d3 e0 e0 e0 f5 e0 76 e0 4a ef
prog 0x0012 67 2f 7d 93 0c 94 0d 00 65 50 41 f0 11 f0 0c 94 0d 00
prog 0x0024 79 93 07 0f 10 1d 0c 94 1c 00 71 93 27 0f 30 1d 0c 94
prog 0x0036 1c 00 73 95 4a 95 51 f7 98 95 ff ff ff ff ff ff ff ff
prog 0x0048 ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff
prog 0x005A ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff ff

```

```
Output Assignment 1B main.asm
Show output from: Build
----- Build started: Project: Assignment 1B, Configuration: Debug AVR -----
Build started.
Project "Assignment 1B.asmproj" (default targets):
Target "PreBuildEvent" skipped, due to false condition; ('$(PreBuildEvent)'!='') was evaluated as (''!='').
Target "CoreBuild" in file "D:\Atmel Studio 7\7.0\Vs\Assembler.targets" from project "D:\Atmel Studio 7\Projects\Assignment 1B\Assignment 1B.asmproj"
Task "RunAssemblerTask"
D:\Atmel Studio 7\7.0\toolchain\avr8\avrassembler\avrasm2.exe -FI -o "Assignment 1B.hex" -m "Assignment 1B.map" -l "Assignment 1B.lss"
AVRASM: AVR macro assembler 2.2.7 (build 69 Jul 26 2017 16:25:06)
Copyright (C) 1995-2017 ATMEL Corporation
[builtin](2): Including file 'D:\Atmel Studio 7\7.0\Packs\atmel\ATmega_DFP\1.2.209\avrasm\inc\m328pdef.inc'
[builtin](2): Including file 'D:\Atmel Studio 7\7.0\Packs\atmel\ATmega_DFP\1.2.209\avrasm\inc\m328pdef.inc'
"ATmega328P" memory use summary [bytes]:
Segment  Begin  End      Code  Data  Used  Size  Use%
-----
[.cseg] 0x000000 0x000040    64    0    64  32768  0.2%
[.dseg] 0x000100 0x000100     0    0     0   2048  0.0%
[.eseg] 0x000000 0x000000     0    0     0   1024  0.0%
Assembly complete, 0 errors, 0 warnings
Done executing task "RunAssemblerTask".
Done building target "CoreBuild" in project "Assignment 1B.asmproj".
Target "PostBuildEvent" skipped, due to false condition; ('$(PostBuildEvent)' != '') was evaluated as ('' != '').
Target "Build" in file "D:\Atmel Studio 7\7.0\Vs\Avr.common.targets" from project "D:\Atmel Studio 7\Projects\Assignment 1B\Assignment 1B.asmproj"
Done building target "Build" in project "Assignment 1B.asmproj".
Done building project "Assignment 1B.asmproj".

Build succeeded.
===== Build: 1 succeeded or up-to-date, 0 failed, 0 skipped =====
|
```

- **SCREENSHOT OF EACH DEMO (BOARD SETUP)**
- **VIDEO LINKS OF EACH DEMO**
- **GITHUB LINK OF THIS DA**

Student Academic Misconduct Policy

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

"This assignment submission is my own, original work".
Worku Tafara