**CECS 225 Homework 5: MIPS load/store, memory alignment & machine code**

1. Conversion from high level language to MIPS assembly:

**High Level Language**

int z = 0; int array[ ] = {5, 10, 15, 20, 25};

void main( void ) {

z = array[4] - array[2] + array[0];

}

**MIPS Assembly**

.data

z: .word 0

array: .word 5,10,15,20,25

.text

addi $20, $0, 16 #$20 = 16

addi $21, $0, 8 #$21= 8

lw $22, array($20) #$22=array[4]

lw $23, array($21) #$23=array[2]

lw $24, array($0) #$24=array[0]

sub $25, $22, $23 #$25=$22-$23

add $25, $25, $24 #$25=$25+$24

sw $25, z($0) #z=$25

1. Determine the content of $27

**MIPS Assembly**

.data

array: .word 1, 5, 12, 4, 10

.text

addi $11, $0, 0

addi $10, $0, 10

addi $7, $0, 7

addi $27, $0, 0

L1: lw $13, array($11)

beq $13, $10, L4

slt $12, $13, $7

beq $12, $0, L2

addi $27, $27, 4

j L3

L2: add $27, $27, $13

L3: addi $11, $11, 4

j L1

L4:

**Tracing the values**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variables/Run** | **Pre-Run** | **1** | **2** | **3** | **4** | **5** |
| **$11** | 0 | 4 | 8 | 12 | 16 |  |
| **$10** | 10 |  |  |  |  |  |
| **$7** | 7 |  |  |  |  |  |
| **$27** | 0 | 4 | 8 | 20 | 24 |  |
| **$13** |  | 1 | 5 | 12 | 4 | 10 |
| **$12** |  | 1 | 1 | 0 | 1 |  |

After the program reach **L4**, the **$27** will contain values of **24**.

1. Convert machine code into MIPS assembly instructions
   1. 32’h8CE77777

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| Hex | 8 | | | | C | | | | E | | | | 7 | | | | 7 | | | | 7 | | | | 7 | | | | 7 | | | |
| Binary | 1 | 0 | 0 | 0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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* 1. 32’h02D7A822
  2. 32’h0B210321
  3. 32’hAFAF0022

1. Determine the following: