CS224 Section 3 QUIZ 1 17.03.2023

Mert Fidan
22101734
Section 3

⇒ Student ID: 22101734

⇒ Last digit of student ID: 4

q-) Box2 value is 4 ⇒ Assembly instructions:

```
funct: beq $t0, $s1, exit
exit:  lw $t0, 4($s0)
       addi $t0, $s0, -5
       jal func
```

↳ beq → I-type ⇒ | opcode (6) | rs (5) | rt (5) | immediate (16) |

↳ opcode = 4 = 000100_2
↳ rs = $t0 = 8 = 01000_2
↳ rt = $s1 = 17 = 10001_2
↳ immediate = 0

⇒ 0001 00 01 000 10001 0000 0000 0000 0000
⇒ 1 1 1 1 0 0 0 0
⇒ 0x11110000 for beq

↳ lw → I-type
↳ opcode = 23_{hex} ⇒ 100011_2
↳ rs = $s0 = 10000_2
↳ rt = $t0 = 01000_2
↳ immediate = $4 = 0100_2 ⇒ sign-extend to 16-bits

⇒ 1000 11 10 000 01000 0000 0000 0000 0100
⇒ 8 E 0 8 0 0 0 4
⇒ 0x8E080004 for lw

↳ addi → I-type
↳ opcode = $8 = 001000_2
↳ rs = $s0 = 10000_2
↳ rt = $t0 = 01000_2
↳ immediate = $-5 = 1011$ (2's complement)
↳ sign-extend

⇒ 0010 00 10 000 01000 1111 1111 1111 1011
⇒ 2 2 0 8 F F F B
⇒ 0x2208FFFB for addi

↳ jal → J-type ⇒ | opcode (6) | addr (26) |

↳ opcode = $3 = 000011_2
↳ addr ⇒ 0040 0004

⇒ first 4 bits of addr, last 2 bits of addr is dropped

⇒ 1100 0000 0100 0000 0000 0000 0000 0001
⇒ C 0 1 0 0 0 0 0 1
⇒ 0xC0100001 for jal

Mert Hanri
22101734
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```
quiz1: addi $sp, $sp, -24   # saving used variables
    sw $ra, 0($sp)
    sw $s0, 4($sp) # Starting address of array
    sw $s1, 8($sp) # size of array
    sw $s2, 12($sp) # i
    sw $s3, 16($sp) # current array item
    sw $s4, 20($sp) # randomint return value
   add $s0, $a0, $0
   add $s1, $a1, $0
  addi $s2, $0, 0
  addi $s3, $0, 0
  addi $s4, $0, 0
while: beq $s2, $s1, done
       jal randomint
       add $s4, $v0, $0   # putting random value to $s4
       lw $s3, 0($s0)
       add $s3, $s3, $s4  # adding random value to current item at current address
       sw $s3, 0($s0)     # loading new value
      addi $s0, $s0, 4    # incrementing address to get the next array item
      addi $s2, $s2, 1    # incrementing i
      j while
done:
      lw $ra, 0($sp)      # loading saved variables
      lw $s0, 4($sp)
      lw $s1, 8($sp)
      lw $s2, 12($sp)
      lw $s3, 16($sp)
      lw $s4, 20($sp)
      addi $sp, $sp, 24
      jr $ra              # exiting function
```