Computer Architecture - Homework #2

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2.8 [10] <§§2.2, 2.3>

Ans:

x30 = &A[1]

x31 = &A[0]

A[1] = &A[0]

x30 = A[1]

f = x30 + x31 = A[1] + &A[0] = &A[0] + &A[0]

2.9 [20] <§§2.2, 2.5>

Ans:

immediate	rs1	funct3	rd	opcode
000000001000_2	01010_2	000_2	11110_2	0010011_2

immediate	rs1	funct3	rd	opcode
000000000000_2	01010_2	000_2	11111_2	0010011_2

imm[11:5]	rs2	rs1	funct3	imm[4:0]	opcode
0000000_2	11111_2	11110_2	011_2	00000_2	0100011_2

immediate	rs1	funct3	rd	opcode
000000000000_2	11110_2	011_2	11110_2	0000011_2

funct7	rs2	rs1	funct3	rd	opcode
0000000_2	11111_2	11110_2	000_2	00101_2	0110011_2

2.18 [10] <§2.6>

Ans:

```
srli x7, x5, 11
slli x7, x7, 58
srli x7, x7, 32
srli x28, x6, 26
```

```
slli x28, x28, 58
srli x28, x28, 32
sub x6, x6, x28
add x6, x6, x7
```

2.23.1 [5] <§2.7, 2.10>

Ans:

UJ-type instruction

2.23.2 [5] <§2.7>

Ans:

```
blt x0, x29, Exit
addi, x29, x29, -1
jal, x0, loop
```

2.34 [30] <§2.9>

Ans:

```
org:
    addi sp, sp, -24
    sd x19, 16(sp)// save x19
    sd x20, 8(sp) // save x20
    sd x21, 0(sp) // save x21
    add x19, x0, x0    // x19 = i = 0+0
    add x20, x0, x0    // x20 = ans = 0+0
    addi x28, x0, 10   // x28 = 10
    add x5, x19, x10   // address of x[i] in x5
    lbu x6, 0(x5) // x6 = x[i]
    addi x7, x6, -45   // x7 = x[i] - 45
    beq x7, x0, L1
    addi x7, x6, -43   // x7= x[i] -43
    beq x7, x0, L2
    addi x21, x0, 1    // x21 = mark = 1
    jal x0, L3    // go to while
L1:
    addi x21, x0, -1   // x21 = mark = -1
    addi x19, x19, 1 // i = i + 1
    jal x0, L3 // go to while
L2:
    addi x21, x0, 1    // x21 = mark = 1
    addi x19, x19, 1 // i = i + 1
    jal x0, L3 // go to while
L3:
    beq x6, x0, L4
```

```
    addi x7, x6, -48   // x7 = temp = x[i] - 48
    bge x7, x28, L5
    blt x7, x0, L5
    mul x20, x20, x28  // x20 = ans = ans * 10
    add x20, x20, x7   // x20 = ans = ans + temp
    addi x19, x19, 1   // i = i + 1
    add x5, x19, x10   // address of x[i] in x5
    lbu x6, 0(x5) // x6 = x[i]
    jal x0, L3    //go to while
L4:
    mul x10, x21, x20  // x10 = mark * ans
    jal x0, L6    //go to L6

L5:
    addi x10, x0, -1
L6:
    ld x21,0(sp)
    ld x20,8(sp)
    ld x19,16(sp)
    addi sp, sp, 24
    jalr x0, 0(x1) // return
```

2.40.1 [5] <§§1.6, 2.13>

Ans:

*(70% * 2) + (10% * 6) + (20% * 3) = 2.6#*

2.40.2 [5] <§§1.6, 2.13>

Ans:

*(70% * x) + (10% * 6) + (20% * 3) = 2.6 * 0.75 = 1.95*

x = 1.071#

2.40.3 [5] <§§1.6, 2.13>

Ans:

*(70% * x) + (10% * 6) + (20% * 3) = 2.6 * 0.5 = 1.3*

x = 0.143#