Justin Fortner

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HW #1

1. A)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Opcode | Dest. Register | Source Register 1 | Source Register 2 |
| # of Bits | 3 | 3 | 3 | 3 |

12 bits needed to encode

B)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Opcode | Register 0 | Register 1 | Immediate |
| # of Bits | 4 | 3 | 3 | 2 |

A 1 or a zero can be added to the opcode. Most likely as the leftmost bit. This will signify to use the immediate value or not. Total number of bits for this ISA is 12.

2) A) 1 xor r0 = 0

2 mov r2 = 2

3 jmp L1

4 bre r0 DNE r2 Loop

5 mul r3 = 0

6 add r4 = r4 + r1

7 ld r5 = 0

8 sub r5 = -5

9 st r6 = -6

10 add r0 = 1

11 bne r0 DNE r2 Loop

12 mul r3 = 0

13 add r4 = r4 + r1

14 ld r5 = -5

15 sub r5 = -10

16 st r6 = -10

17 add r0 = 2

18 bre r0 = r2

19 mov r1 = 2 = r2

B) 1/((1-(4-19))+((4/19)/20)) = 1.25 x speedup

C) 1/((1-(4-19))+((4/19)/∞)) = 1.266x speedup

3) A) Processor A = .5(1) + .2(2) + .2(3) + .1(2) = 1.7CPI

Processor B = .5(1) + .2(2) + .2(2) + .1(4) = 1.7CPI

B) They are the same speed. Therefore speedup is 1.

C) I would choose load because there are twice as mane load instructions as there are branch instructions.

D) 1/(1.7\*10^-3) = 588 MIPS

E) Arithmetic Mean

A = (10^9) \* (1.7) \* (3\*10^9) = 5.1 Seconds

B = (10^9) \* (1.7) \* (3.4) = 3.4 Seconds