0907432 Computer Design (Spring 2019)
Quiz 1

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Instructions: Time **15** minutes. Open book and notes exam. No electronics. Please answer all problems in the space provided and limit your answer to the space provided. **No questions are allowed**.

<Good Luck>

P1. A program spends 80% of its execution time executing floating-point instructions. How much you need to speed up these instructions in order to get an overall speedup of 4.0?

<u>The solution using Amdahl's law is:</u>

Overall Speedup = 1 / (1-f + f/s)

4.0 = 1 / (0.2 + 0.8/s)

0.2 + 0.8/s = 1 / 4.0 = 0.25

0.8/s = 0.05

s = 0.8/0.05 = 16

P2. Unroll the following loop two times and use the table below to schedule the unrolled loop efficiently for the static dual-issue processor described in the class.

```
Loop:    ld   x31,0(x20)      // x31=array element
         add  x31,x31,x21     // add scalar in x21
         sd   x31,0(x20)      // store result
         addi x20,x20,-8      // decrement pointer
         blt  x22,x20,Loop    // branch if x22 < x20
```

	ALU/branch	**Load/store**	**Cycle**
Loop:		**ld x31,0(x20)**	1
	addi x20,x20,-16	**ld x30,-8(x20)**	2
	add x31,x31,x21		3
	add x30,x30,x21	**sd x31,16(x20)**	4
	blt x22,x20,Loop	**sd x30,8(x20)**	5
			6
			7