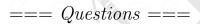
CS4410 Homework 1

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Generated for cs4410 Friday, February 12, 6pm ET

Question	#Points	s Percentage		
1. Tell us about yourself	8	14.3%		
2. Computer Arithmetic	24	42.9%		
3. Architecture	16	28.6%		
4. Harmony	8	14.3%		
Total	56	100.0%		

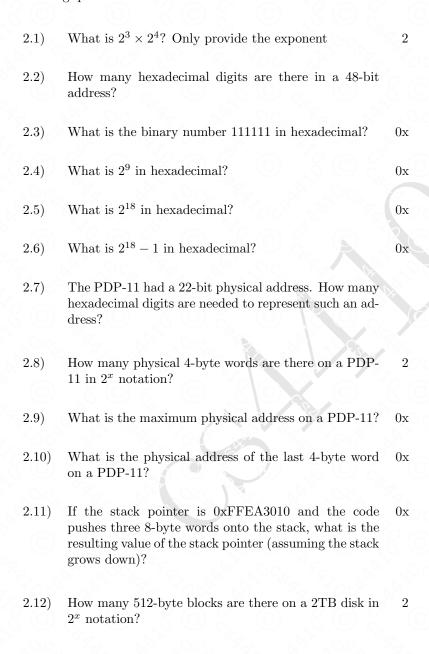
Question 1: [8 points] Tell us about yourself

- 1.1) What is your NetID?
- 1.2) What is the time difference with Cornell (e.g., -3 if in San Francisco, 0 in Ithaca, 5 if in London, 12 if in China)?
- 1.3) Would you like to opt out from study groups?
- 1.4) (Optional) What are your preferred pronouns?

(Optional) We would like to get to know you better. Tell us a few more things about yourself below:

Question 2: [24 points] Computer Arithmetic

Read https://www.cs.cornell.edu/courses/cs4410/2021sp/resources/background.pdf and answer the following questions:



Question 3: [16 points] Architecture

Select one for each of the following questions. You get 4 points for each correct answer, 0 points for each wrong answer, and 1 point for a question left open.

(3.1) In a memory-mapped	disk device, a core	e can read a	word	from	\mathbf{the}	disk	using	\mathbf{a}	load
machine instruction just lik	e it can read a word	l from RAM	. Selec	t one:					

True False

(3.2) When a processor executes an instruction, the PC is always increased. Select one:

True False

(3.3) Divide-by-zero is an example of an asynchronous, maskable signal. Select one:

True False

(3.4) For efficiency, different cores of the same CPU can share the same registers and their stack. Select one:

True False

Question 4: [8 points] Harmony

Read Chapters 1 and 2 of the Harmony book (available at harmony.cs.cornell.edu). This question is designed just to make sure that you are able to enter and run Harmony programs.

Consider the following Harmony program (which you can download from www.cs.cornell.edu/courses/cs4410/2021sp/resources/pascal.hny):

```
const N = 2
def factorial(n):
    result = 1 if n == 0 else (n * factorial(n - 1))
def C(n, k):
    result = factorial(n) / (factorial(k) * factorial(n - k))
def pascal(x, n, k):
    result = 0
    while x > 0:
        if k == n:
            k, n = 0, n + 1
        else:
           k += 1
        result += C(n, k)
        x = 1
x = choose({0..N})
assert pascal(x, 0, 0) == x
```

It asserts that pascal(x,0,0) == x for all x from 0 to N (inclusive). However, the program only tests for $N \in \{0,1,2\}$.

- 4.1) What is the lowest non-negative integer N for which the assertion fails? Enter 'inf' if you think there is no such N (no proof required).
- 4.2) Same question, but replace the assertion with $\mathtt{pascal}((x*(x+1))/2,0,0) == ((2**x)-1)$