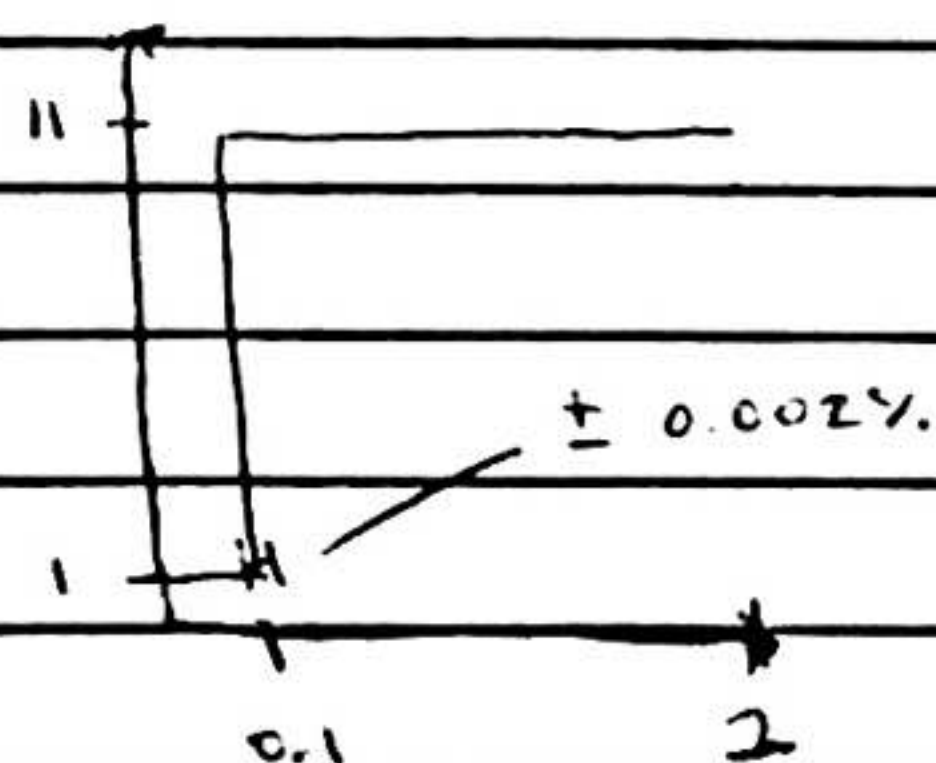Homework 1
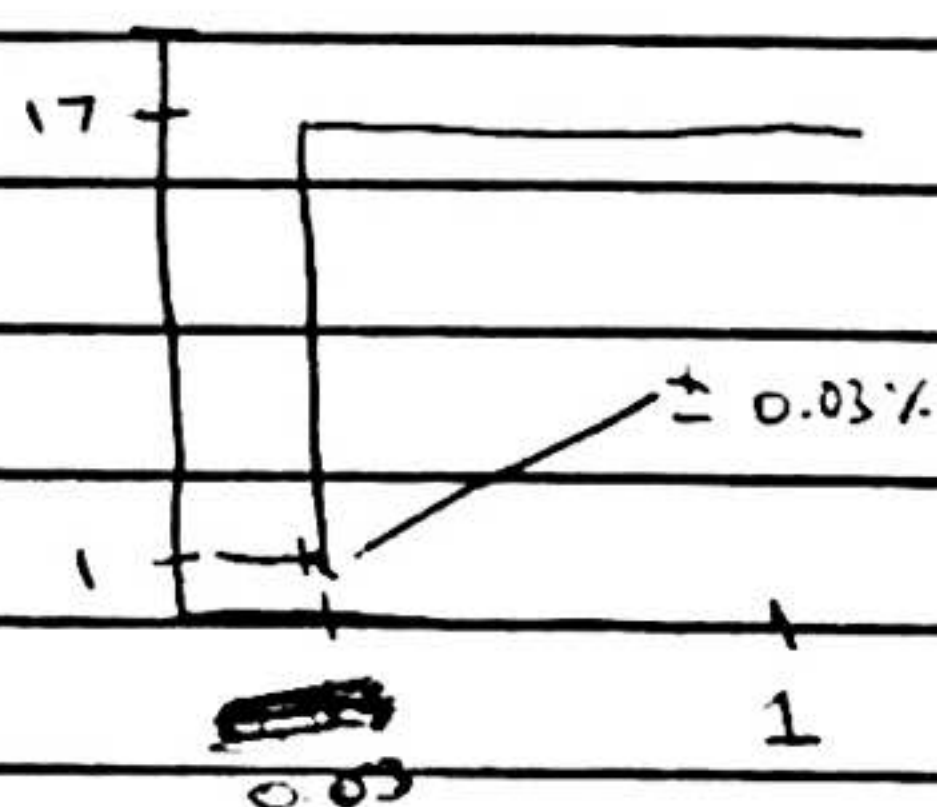
Problem 1

a) I ran 10,000 trials with random reads and found that the access time for cached data averages 16.5 cycles while for uncached data it averages 10.999.

b) I again ran 10,000 trials, this time with parameters laid out like mentioned on the homework. I found the cached solution to average 5.878 cycles while the uncached solution averaged 6.256 cycles.

c) The worst case access time happens when the cache is enabled but the requested address is not cached, coming in at 17 cycles.
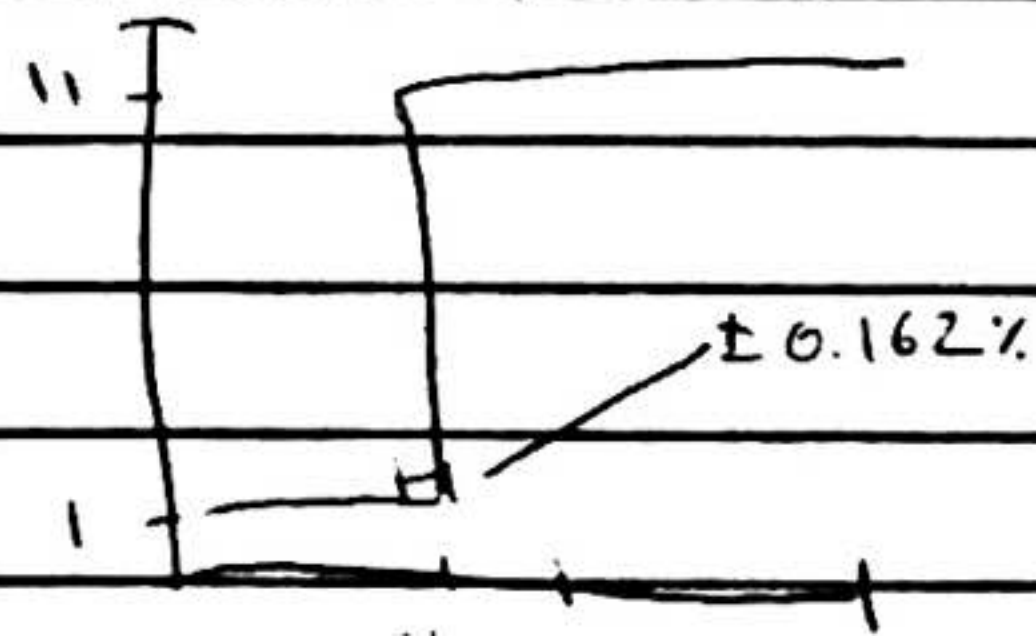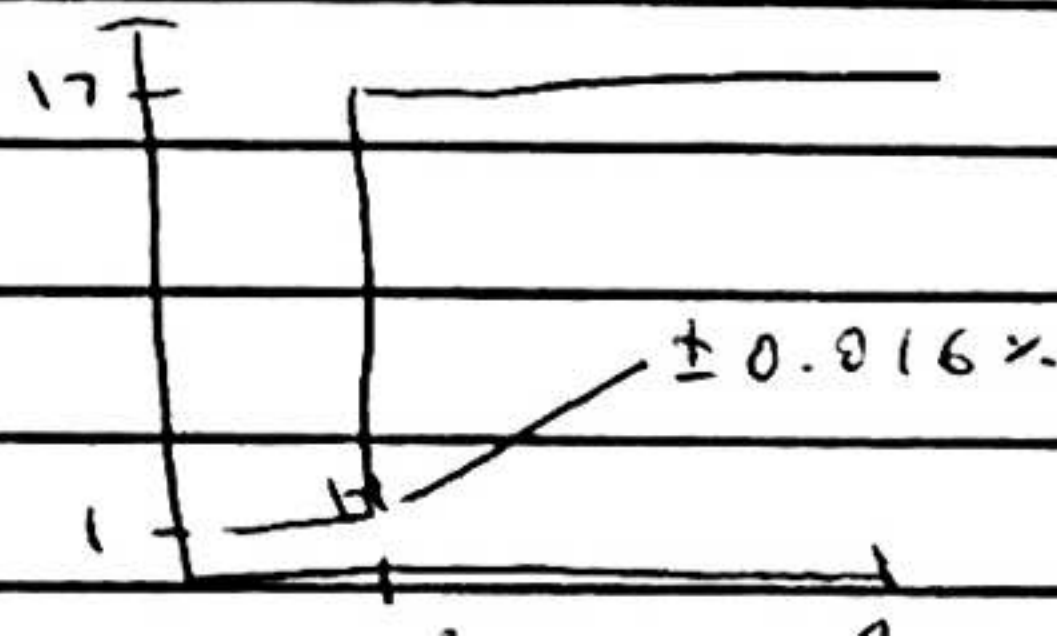
d) A Disabled)   A Enabled)

11 ┤   17 ┤
                    ± 0.002%   ± 0.03%
1 ┤   1 ┤
    0.1   2   0.03   1

B Disabled)   B Enabled)

11 ┤   17 ┤
                    ± 0.162%   ± 0.016%
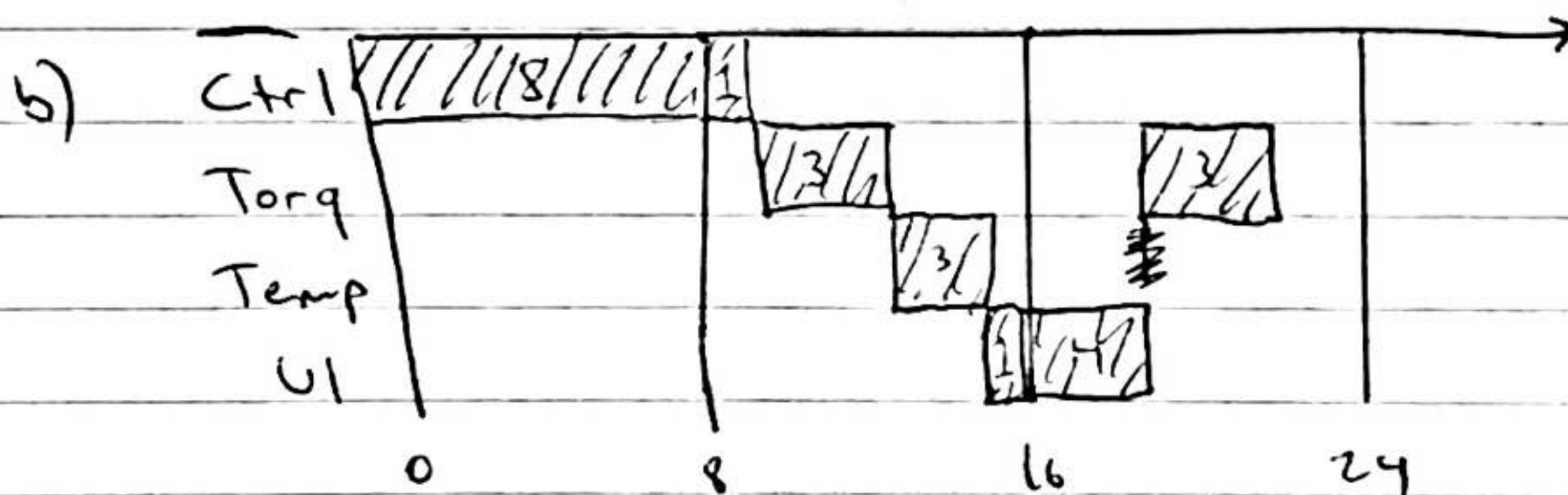1 ┤   1 ┤

d) Based on the CDF, around ~~[crossed out]~~ 58.25% of the calls will take less cycles than the worst-case scenario of 17 cycles. This is hard to estimate in a real system due to all the caching variables and rates of how often the devices are caching data.

Problem 2

a) $U = \frac{9}{24} + \frac{3}{18} + \frac{3}{30} + \frac{5}{30}$

$= \frac{3}{8} + \frac{1}{6} + \frac{1}{10} + \frac{1}{6}$

$= \frac{3}{8} + \frac{4}{3} + \frac{1}{10}$

$= 0.808$

b)

Ctrl Period: 24
Torq Period: 11, 13
Temp Period: 24
UI Period: 24

c) $\frac{9}{24} + $ ~~[crossed out]~~ $\frac{6}{24} + \frac{3}{24} + \frac{5}{24}$

$\boxed{\frac{23}{24}}$

d) Effective utility:

$$\frac{9}{20} + \frac{3}{10} + \frac{3}{30} + \frac{5}{30}$$

$$= 1.0166$$

Since it's greater then 1,
the loop will fail

e)

Ctrl	////////9////////			
Torq			2 3	
Temp			///3//	
UI				//8//

f) $9/20 + 3/20 + 3/20 + 5/20$

$$\boxed{= 1}$$