CS 261 - Data Structure **Spring 2017**

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HomeWork 3

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Problem 1 **Solution:**

(a) $k + 1$

(b) $\frac{32*n}{\alpha} = 64n$

(c) $k > 64n$

Problem 2 **Solution:**

(a) a = 0x01020304

b = 0x01030504

c = 0x03020504

d = 0x03030304

(b) $3 * 2^{-16} * 2^{-16} - 2 * (2^{-16})^3 \approx 3 * 2^{-32}$

Problem 3 **Solution:**

(a) for a bit(b_i) in bit array:

$P(b_i \text{ is nonzero}) = 1 - P(b_i \text{ is zero}) = 1 - (1 - \frac{1}{b})^{3n}$

Thus number of nonzero bit:

$E = b * P(b_i \text{ nonzero}) = b - b * (1 - \frac{1}{b})^{3n}$

(b) $6000 - 6000 * (1 - \frac{1}{6000})^{3000} \approx 2361$

Problem 4 **Solution:**

Let's say the key set is $\{k * 2^{16} | 0 \leq k < 2^{16}\}$. For any randomly choosen a,b:

$H(x) = (ax + b) \mod 2^{16}$
$= (ak * 2^{16}) \mod 2^{16} + b \mod 2^{16}$
$= b$

Then all the key would fall in same slot b.