Algorithms and Data Structures
Algorithm Assignment: Lecture 4

ID: Name:

1. Using the Binary Search algorithm specified in the lecture note, find a key = 15 from a sequence A = {1, 2, 2, 3, 5, 8, 9, 13, 14, 15, 18, 20, 21, 22, 25, 28, 31, 33, 33, 58, 69, 70, 71, 72, 86, 98, 99}. Let bsearch(*l, r*) be a binary search operation for a range (*l, r*) of the sequence. You should illustrate how the algorithm works by indicating pointers *l*, *m* and *r* where $m=\left⌊\frac{l+r}{2}\right⌋$.

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

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1 2 2 3 5 8 9 13 14 15 18 20 21 22 25 28 31 33 33 58 69 70 71 72 86 98 99

bsearch(0, 27)

**l m r**

1 2 2 3 5 8 9 13 14 15 18 20 21 22 25 28 31 33 33 58 69 70 71 72 86 98 99

bsearch( , )

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bsearch( , )

2. Fill out a hash table *H* based on the following conditions:

(a) The size of *H* is 7 (*m* = 7).

(b) You should insert 7 characters A, L, G, O, R, I and T in this order.

(c) Use a key 0 for A, 1 for B, ... , and 25 for Z.

(d) Use double hashing to compute the slot for a character. You should use the following hash functions:

* $h\left(k, i\right)=(h\_{1}\left(k\right)+i× h\_{2}\left(k\right))$ mod $m$
* $h\_{1}\left(k\right)=k$ mod $m$
* $h\_{2}\left(k\right)=1+k$ mod $(m-1)$

