

CE/CZ 2001 Tutorial 4 (Searching)

1. A sequence x_1, x_2, \dots, x_n is said to be cyclically sorted if the smallest number in the sequence is x_i for some i , and the sequence $x_i, x_{i+1}, \dots, x_n, x_1, \dots, x_{i-1}$ is sorted in increasing order. Give an algorithm to find the minimal element in the sequence in $O(\log n)$ time.
2. The type of a hash table H under closed addressing is an array of list references, and under open addressing is an array of keys. Assume a key requires one "word" of memory and a linked list node requires two words, one for the key and one for a list reference. Consider each of these load factors for *closed* addressing: 0.5, 1.0, 2.0.



Estimate the total space requirement, including space for lists, under closed addressing, and then, assuming that the *same amount* of space is used for an open addressing hash table, what are the corresponding load factors under open addressing?

3. A hash table with 11 entries is used to store keys under open addressing and double hashing policy. The various functions to be used are:

```
hashFunction(k) = k mod 11
hashIncr(k) = k mod 9 + 1
rehash(j, d) = (j + d) mod 11
```

Give an algorithm to insert a key in a hash table under open addressing and double hashing policy. Assume that the code for the functions *HashFunction()*, *hashIncr()* and *rehash()* as defined above are available for use.

