CS29003 ALGORITHMS LABORATORY
Assignment No: 7
Last Date of Submission: 11-September-2014

Let A and B two strings of lengths n and m over an alphabet Σ. (An *alphabet* is a finite set of symbols from which the individual characters of a string are chosen.) Assume that n is somewhat larger than m, and the size of the alphabet Σ is small. (Work with alphabets like $\{a, b\}$, $\{a, b, c\}$, $\{a, b, c, d\}$.) For $t \geq 0$, define B_t to be the string B with each character repeated t times. For example, if B is the string *ccab*, then B_3 = *ccccccaaabbb*.

A string $D = d_0 d_1 \ldots d_{l-1}$ is called a *subsequence* of a string $C = c_0 c_1 \ldots c_{k-1}$ if $d_j = c_{i_j}$ for all $j = 0,1,2,\ldots, l-1$ for some indices in C satisfying $0 \leq i_0 < i_1 < i_2 < \ldots < i_{l-1} \leq k-1$. This means that all the symbols in D appear in the same sequence in C, although not necessarily consecutively. In this assignment, you write a program to find the largest t for which B_t is a subsequence of A. Note that the only possible values of t are 0, 1, 2, . . . , floor(n/m).

Write a function `issubseq()` to check whether one string is a subsequence of another.

Write a function `genBt()` to generate B_t from B and t.

Write a function `findt()` to compute the largest desired t mentioned above. This function would call the above two functions and should have a running time of the order O(n log(n/m)).

Write a `main()` function to do the following:

- Read two strings A and B of lengths n and m, respectively.
- Call the function `findt()` to get the desired value of t.
- If $t > 0$, then print the match of B_t in A in the format given below.

Sample Output

In the example below, we have taken $\Sigma = \{a, b, c\}$, $n = 75$, and $m = 5$. In this example, the largest t is 6. Convince yourself that B_7 is not a subsequence of A.

```
A = cbcacaccbcacccbacaccbcaccbbcbbaaaabcabcaaaaaabaaccabbbaccbbbabcacbaaaaacbac
B = cbaab
t = 6
cbcacaccbcacccbacaccbcaccbbcbbaaaabcabcaaaaaabaaccabbbaccbbbabcacbaaaaacbac
c c c cc c    b     b    bb bbaaaa  a  aaaaaa a    bbb   bbb
|--------|    |--------------||--------||-----|    |-------|
```

Here is another example in which $|\Sigma| = 6$. Now, the largest computed t is 1.

```
A = ccdeefceedafadbfccccfbbbaeeafcacddabcadecbeafdfffbcdadcffbfedfaabffbdaafcca
B = fffec
t = 1
ccdeefceedafadbfccccfbbbaeeafcacddabcadecbeafdfffbcdadcffbfedfaabffbdaafcca
     f     f   f         e   c
     |     |   |         |   |
```