

CECS 428 Programming Assignments

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Every problem will be sent as an email attachment called `input.zip`. Unzip this file in the standard way to retrieve the files that you are supposed to have for each assignment. When you submit your file(s), you will zip them into a file called `output.zip`. In the first assignment, for example, the output file is `gray.txt`, but when you submit, you will submit the file `output.zip` (which will be `gray.txt`, zipped up and renamed if necessary).

If your response files contain extra white space or added characters, they will be counted as incorrect.

For each assignment, an example input and output will be emailed to everyone via Beachboard so that you can get an idea of how the formatting should look.

1 n -ary Gray codes

n -ary Gray codes are codes that begin at $0 \dots 0$ (n 0's) and change by exactly 1 in exactly one digit (modulo k) at every step. They were once used for converting analog signals to binary in such a way that an incorrectly reported voltage would not cause too many bit errors in the final result.

Your job is to write a Gray code to file. The input to your program, in `parameters.txt`, will be two positive integers k and N , separated by a comma. Your job will be to write a program that creates a Gray code consisting of all strings $s \in \{0, 1, \dots, k-1\}^N$, starting with $0 \dots 0$, such that one codeword differs from the next in exactly one character and, in that character, by exactly 1 modulo k . These codewords should be written out to a text file, `gray.txt`, with exactly one codeword per line.

For example, if $k = 2$ and $N = 3$, your output file could look like the following:

```
000
001
011
010
110
111
101
```

In this case, the final codeword is “adjacent” to the initial codeword, but that is not necessary in general. As long as the first codeword contains all zeroes and every codeword is represented and no codeword is repeated, the answer will be marked correct. (Note that there are many correct answers to this. Any one will be counted.)