

## Homework: manual test generation for `grep`

1. (100 points) Generate a set of test cases for the attached `grep v2.0` that achieves high statement and branch coverage.
  - A. Read online `grep` manual carefully to understand the functionality of `grep`.
    - Note that some options for the latest `grep` version may not work for `grep v2.0`
  - B. Download `grep_v2.0.zip` from the class web page and compile it by `gcc -coverage grep.c -o grep20`
  - C. Create (**at least 10**) test cases to exercise different options, patterns, and target files to cover as many statements and branches as you can.
  - D. Measure both statement coverage (i.e., lines executed) and branch coverage of the created test cases by using `gcov`. Your test cases must achieve more than 50% branch coverage.
  - E. Identify the functions which are not covered at all (to improve coverage further later)

You should submit the following items so that TA can replay your testing result completely (any missing information will reduce score).

- a. The text file `test_script` which contains `grep` commands (or script to generate `grep` commands) each of which corresponds to your test case
    - Ex.  
`grep20 -B 5 -n [a-z][0-9][a-z] abc.c`  
`grep20 000 abc.txt`  
...
    - For realistic testing experience in practice (under time pressure and computing resource pressure), `test_script` should complete in less than 1 minute and a target file such as `abc.txt` should be less than 100 Kbytes long.
  - b. A target text files which are used by `test_script`
    - Ex. `abc.c`, `abc.txt`
  - c. A total number of the statements and the statement coverage achieved by the test cases
  - d. A total number of the branches and the branch coverage achieved by the test cases
    - You have to report the number of **taken branches**
  - e. The **“best” (i.e. the most effective) test case** which achieves the largest branch coverage among the test cases you created and its branch coverage achieved.
  - f. A list of the **3 test cases** that achieve the largest branch coverage altogether and the accumulated branch coverage achieved by the 3 test cases (known as *test case prioritization*).
  - g. A list of functions which are not executed at all by your test cases.
2. (Extra 100 points) If your branch coverage obtained from all of your test cases belongs to the top 3 highest ones among your classmates, you will get extra 100 points.