Missing semester: QUESTIONS

Version Control (Git)

Theory:

1) In which category/class of system is Git from? Explain briefly the meaning of it.
2) What is the theory model of history is Git based on? Explain briefly the meaning of it in Git.
3) In Git terminology, what are typically a tree and a blob?
4) How does Git address all its objects (blob/tree/commit)?
5) What is a reference in Git? Give the name of one special reference.
6) In Git terminology, what is the difference between rebasing and merging?
7) In Git terminology, what is the difference between cloning and pulling?
8) In Git terminology, what is the difference between fetching and pulling?
9) Give 10 Git commands (without options) along with one line explanation per one. <u>Bonus</u>: Give 20.
10) What is the maximum number of characters allowed in the name of a commit to respect the common good practice rules?

Practice:

1) Suppose you have just cloned a repository. What command do you use for:
    a) Exploring the version history by visualizing it as a graph?
    b) Finding who was the last person to modify *README.md*?
    c) Finding what was the commit message associated with the last modification to the line 7 of *README.md*?
2) Suppose you want to discard uncommitted changes and make the 'master' reference point to commit 5d83f9e. What are the (two) commands you can use to do that?
3) How do you find a list of files that have changed in the commit 5d83f9e?
4) Suppose you want to switch branches and you didn't finish your work in the branch you were in and don't want to commit a half-done work. What would you do?
5) Suppose you commited a large file that should not be managed by Git or added sensitive information. What is the command name for deleting that file from Git history? <u>Bonus</u>: Give the entirely command (command name with options).
6) Suppose you want to define global ignore patterns to exclude text files and C object files in *~/.gitignore_global*. What are the commands for doing that?
7) With which command would you return a commit that has just been pushed and made open?
8) Suppose you added a file in the staging area that you didn't want to commit. How to remove that file from git without removing it from your file system?
9) How do you squash the last N commits into a single commit?
10) Explain the principle of Git bisect to determine the source of a (regression) bug?

Debugging and Profiling

Theory:

1) In which folder most programs usually write their own logs in?
2) Explain the *journalctl* bash command. What is the equivalent for Mac OS?
3) What is a logger in UNIX systems terminology?
4) Display "Hello World" in the system log and check it.
5) What is the name of the commonly used python debugger?
6) Give five of its commands along with one line explanation for each.
7) What is a profiler? Give examples of its usage.
8) What are the three times used to measure the performance of a program and what are the differences between them?
9) What is the name of the commonly used C/C++ memory debugger?
10) What is the name of the commonly used profiler to display CPU profiling?

Metaprogramming

Theory:

1) In “build systems”, what are the three things needed to define a “build process”?
2) What is one of the most common build systems used today? Explain briefly how it operates and its syntax.
3) When defining a build process, give three examples of “pattern” along with one line explanation for each one.
4) Give three examples of common repositories that host a large number of dependencies.
5) In semantic versioning, what is the form of every version number?
6) In semantic versioning, what are the rules followed to change a version number?
7) What is a “lock file” and when is it used?
8) Define briefly what is continuous integration and give one example of a CI system used by the company.
9) What is a “test suite”? Give three examples of different types of common tests.
10) What is “mocking” in test terminology?

Security and Cryptography

Theory:

1) Define the entropy in cryptography terminology and its value when selecting uniformly at random from a set of possible outcomes called Ω.
2) What is the return of the SHA1 hash function?
3) Give three properties of a hash function along with their meaning.
4) Give two examples when hash functions are used in worldwide projects.

5) Define what are key derivation functions (KDFs).
6) Define what is symmetric cryptography.
7) Define what is asymmetric cryptography.
8) Explain the *ssh-keygen* command from a cryptographic aspect.
9) Give the name of one software for Linux, for Windows, and for macOS users one can use to encrypt its full disk.
10) Give the name of three password managers.

Practice:

1) Suppose a password is chosen as a concatenation of four lower-case dictionary words, where each word is selected uniformly at random from a dictionary of size 100,000. An example of such a password is *correcthorsebatterystaple*. How many bits of entropy does this have?
2) Consider an alternative scheme where a password is chosen as a sequence of 8 random alphanumeric characters (including both lower-case and upper-case letters). An example is *rg8Ql34g*. How many bits of entropy does this have?
3) Suppose an attacker can try guessing 10,000 passwords per second. On average, how long will it take to break each of the passwords?
4) Suppose you want to encrypt a message (e.g. ‘hello’) in your terminal using the SHA1 hash. What command would you use?
5) Suppose you just downloaded a Debian image (called *debian-10.7.0-amd64-netinst.iso*) from a mirror (e.g. not the official website). What would you do (and which command would you use) to check this file is not corrupted.
6) Suppose you want to encrypt a file with AES encryption, using OpenSSL. Which command would you use? Suppose you send it to your friend. Which command he/she would use in order to decrypt it?
7) Suppose you want to encrypt a message using symmetric encryption but you are afraid of losing/not remembering your key. Come up with a strategy to bypass this issue.
8) Suppose you want to sign a Git commit. What command would you use? Now suppose you want to verify the signature on a commit. What command would you use?
9) Suppose you want to create a signed Git tag. What command would you use? Now suppose you want to verify the signature on the tag. What command would you use?
10) What is the common tool for encrypting messages with asymmetric cryptography? What commands would you use to encrypt and to decrypt a message with this tool?