Part A

The disadvantages of the traditional flat file system are that complex directory hierarchies are expensive, random accessing file contents is difficult due to things being stored as a chain, and the number of files on a volume is fixed due to finite directory slots. This is changed by the cylinder group system. Here, information about files and subdirectories are stored in inodes which allow non-chain implementation of data storage as well as flexibility in amount of directory entries. The nonchain implementation allows fast random access to files. The inode system makes complex directories simpler due to having the “type” field in the inode. The advantage of this when using an SSD is similar to the hard disk due to SSDs being designed to replace hardisks. However, the SSD needs no spatial locality-based features due it being a non-mechanical storage device. The SSD doesn’t need to rely on a mechanical needle moving to a spot to find data, which makes it directory and file operation time much faster than that of the hard disk.

Part B

List of reason unmount would fail:

* EBUSY: To unmount a volume, it cannot have any open dependencies on it.
* EFAULT: The unmount command points to an address space outside of the user’s address space. (For example, Rafi running a bad program cannot unmount Rayhan’s volume)
* EPERM: The caller of the unmount does not have permission to call unmount
* ENAMETOOLONG: The name of the specified target exceeds max path length
* EINVAL: The specified target exists but is not a mount point
* ENOENT: the specified target was empty or did not exist
* ENOMEM: there is not enough memory available to copy the volume’s data into

Part C

The atime, meaning access time, is the time a file was last accessed. The file was last accessed by the “touch” command to change its metadata. Therefore, the atime will be “Sep 26, 2018 1:30:00pm.” The mtime, meaning the modification time, changes when a file’s content changes (content doesn’t include metadata). The mtime of the file would be “Sep 26, 2018 1:00:00pm” but the “touch -m -t” command changes it a specific timestamp. The timestamp here is “Sep 9, 2018 1:13:12pm” making the mtime of the file the same value. The ctime, meaning change time, is the time a file was last changed. Unlike the mtime, the ctime changes when you change a file’s metadata. This means that the ctime changed when the “touch” command changed the mtime of the file, making the ctime “Sep 26, 2018 1:30:00pm.”

atime: Sep 26, 2018 1:30:00pm

mtime: Sep 9, 2018 1:13:12pm

ctime: Sep 26, 2018 1:30:00pm