Name: _____ USC ID: _____

Quiz 4: Network File systems (10 points), 10 minutes

1. [2 points] Name two advantages and two disadvantage of client-server architecture of network file system.
   Advantages: Easy sharing, Centralized administration, Security
   (1pt, partially correct or contain wrong answer -0.5pt)
   Disadvantages: Network overhead, More components to fail
   (1pt, partially correct or contain wrong answer -0.5pt)

2. [2 points] Compare file descriptor with file handle.
   File handle contains 3 parts: Volume identifier, Inode number, Generation number.
   (1pt, partially correct or contain wrong answer -0.5pt)
   File descriptor: A file descriptor is a non-negative integer, corresponding to the file.

3. [4 points] Describe the process of executing int fd = open("/home/ec2-user/abc.txt", RD_ONLY) over a network file system.
   Step 1, LOOKUP(root file handle, "home") to obtain home's file handle.
   Step 2, LOOKUP(home's FH,"ec2-user") to obtain ec2-user's file handle.
   Step 3, LOOKUP(ec2-user's FH, "abc.txt") to obtain abc.txt's file handle and its attributes, check whether the user can read it or not. If not, return -1.
   Step 4, Store abc.txt's file handle in table, allocate the corresponding file descriptor with current file position zero, return file descriptor.

   Three LOOKUP(2pts, if abc.txt's FH is not obtained step by step -1pt, answer in inode layer -1pt), return and check(0.5pt) attributes, store FH in table(0.5pt), allocate(0.5pt) and return(0.5pt) FD

4. [2 points] Explain what an idempotent operation is. Give an example of such an operation in the NFS protocol.
   Idempotent operation means the effect of the operation is the same as single execution no matter how many times you execute.
   Example: LOOKUP, READ, ReadDir, Write