

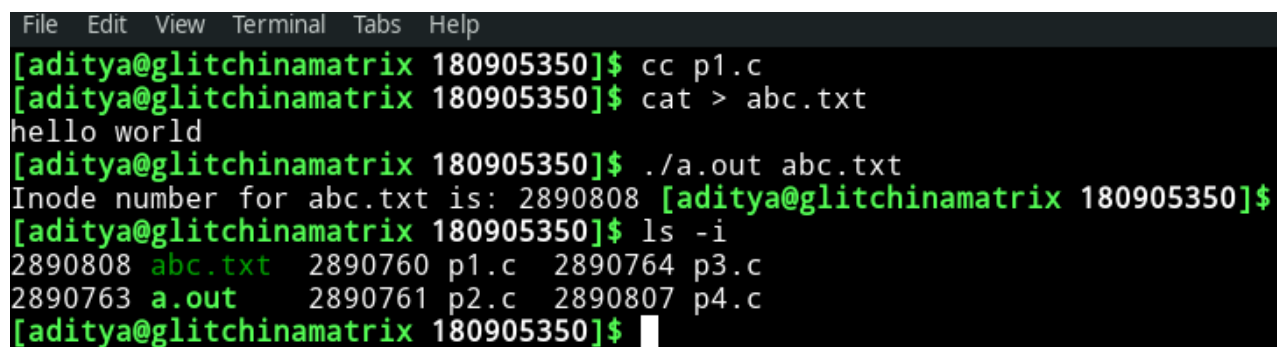
Q1)

code

```
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <stdio.h>
int main (int argc, char *argv[])
{
    struct stat sb;
    int ret;
    if (argc < 2) {
        fprintf (stderr, "usage: %s <file>\n", argv[0]);
        return 1;
    }
    ret = stat (argv[1], &sb);
    if (ret) {
        perror ("stat");
        return 1;
    }

    printf ("Inode number for %s is: %ld ", argv[1], sb.st_ino);
    return 0;
}
```

Output



A terminal window with a dark background and green text. The window has a menu bar with 'File', 'Edit', 'View', 'Terminal', 'Tabs', and 'Help'. The user is at a prompt '[aditya@glitchinamatrix 180905350]\$' and runs 'cc p1.c'. Then they run 'cat > abc.txt' and the terminal shows 'hello world'. Next, they run './a.out abc.txt' and the output is 'Inode number for abc.txt is: 2890808'. Finally, they run 'ls -l' and the terminal shows a list of files with their permissions, owners, groups, sizes, and names: '2890808 abc.txt 2890760 p1.c 2890764 p3.c 2890763 a.out 2890761 p2.c 2890807 p4.c'. The prompt is currently at the end of the last line.

```
File Edit View Terminal Tabs Help
[aditya@glitchinamatrix 180905350]$ cc p1.c
[aditya@glitchinamatrix 180905350]$ cat > abc.txt
hello world
[aditya@glitchinamatrix 180905350]$ ./a.out abc.txt
Inode number for abc.txt is: 2890808 [aditya@glitchinamatrix 180905350]$
[aditya@glitchinamatrix 180905350]$ ls -l
2890808 abc.txt 2890760 p1.c 2890764 p3.c
2890763 a.out 2890761 p2.c 2890807 p4.c
[aditya@glitchinamatrix 180905350]$
```

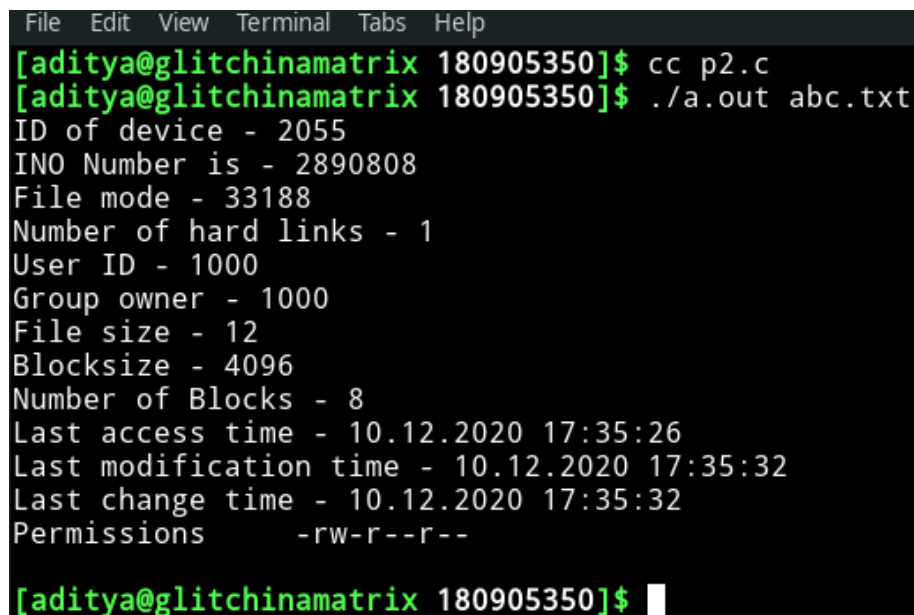
Q2)

Code

```
#include <sys/types.h>
#include <sys/stat.h>
#include <unistd.h>
#include <stdio.h>
#include <time.h>
#include <stdlib.h>
#include <dirent.h>
#include <string.h>
char* formatdate(char* str, time_t val)
{
    strftime(str, 36, "%d.%m.%Y %H:%M:%S", localtime(&val));
    return str;
}
int main(int argc, char *argv[]) {
    struct stat sb;
    if(argc < 2) {
        printf("Insufficient arguments!\n");
        return 1;
    }
    int ret;
    char date[36];
    ret = stat(argv[1], &sb);
    if(ret) {
        perror("stat");
        return 1;
    }
    printf("ID of device - %d\n", sb.st_dev);
    printf("INO Number is - %llu\n", sb.st_ino);
    printf("File mode - %hu\n", sb.st_mode);
    printf("Number of hard links - %d\n", sb.st_nlink);
    printf("User ID - %d\n", sb.st_uid);
    printf("Group owner - %d\n", sb.st_gid);
    printf("File size - %lld\n", sb.st_size);
    printf("Blocksize - %d\n", sb.st_blksize);
    printf("Number of Blocks - %lld\n", sb.st_blocks);
    printf("Last access time - %s\n", formatdate(date,sb.st_atime));
    printf("Last modification time - %s\n", formatdate(date,sb.st_mtime));
    printf("Last change time - %s\n", formatdate(date,sb.st_ctime));
    DIR * dp;
    struct dirent * entry;
    struct stat statbuf;
    if((dp = opendir(".")) == NULL) {
        printf("Cannot open directory \n");
        return 0;
    }
}
```

```
chdir(".");
while((entry = readdir(dp)) != NULL){
    lstat(entry->d_name,&statbuf);
    if(!S_ISDIR(statbuf.st_mode)){
        if(strcmp(entry->d_name,argv[1])==0){
            printf("Permissions\t");
            printf( (S_ISDIR(statbuf.st_mode)) ? "d" : "-");
            printf( (statbuf.st_mode & S_IRUSR) ? "r" : "-");
            printf( (statbuf.st_mode & S_IWUSR) ? "w" : "-");
            printf( (statbuf.st_mode & S_IXUSR) ? "x" : "-");
            printf( (statbuf.st_mode & S_IRGRP) ? "r" : "-");
            printf( (statbuf.st_mode & S_IWGRP) ? "w" : "-");
            printf( (statbuf.st_mode & S_IXGRP) ? "x" : "-");
            printf( (statbuf.st_mode & S_IROTH) ? "r" : "-");
            printf( (statbuf.st_mode & S_IWOTH) ? "w" : "-");
            printf( (statbuf.st_mode & S_IXOTH) ? "x" : "-");
            printf("\n\n");
        }
    }
}
```

Output



```
File Edit View Terminal Tabs Help
[aditya@glitchinamatrix 180905350]$ cc p2.c
[aditya@glitchinamatrix 180905350]$ ./a.out abc.txt
ID of device - 2055
INO Number is - 2890808
File mode - 33188
Number of hard links - 1
User ID - 1000
Group owner - 1000
File size - 12
Blocksize - 4096
Number of Blocks - 8
Last access time - 10.12.2020 17:35:26
Last modification time - 10.12.2020 17:35:32
Last change time - 10.12.2020 17:35:32
Permissions      -rw-r--r--

[aditya@glitchinamatrix 180905350]$
```

Q3)

Code

```
#include<sys/types.h>
#include<sys/stat.h>
#include<unistd.h>
#include<stdio.h>
#include <inttypes.h>
#include<stdlib.h>
void main(int argc, char* argv[])
{
    if(argc<2)
    {
        printf("Insufficient arguments\n");
        return;
    }
    char new_path[100]="random.txt";
    struct stat start;
    int ret1 = stat(argv[1],&start);
    printf("Number of hard links:%ld\n", start.st_nlink);
    system("ls");
    printf("Linking..\n");
    int ret2 = link(argv[1],new_path);
    struct stat intermediate;
    int ret3 = stat(argv[1],&intermediate);
    printf("Number of hard links:%ld\n", intermediate.st_nlink);
    printf("New path:%s\n",new_path);
    system("ls");
    int ret4 = unlink(argv[1]);
    struct stat ending;
    int ret5 = stat(new_path,&ending);
    printf("Unlinking...\n");
    printf("Number of hard links after unlinking:%ld\n", ending.st_nlink);
    system("ls");
}
```

Output

```
File Edit View Terminal Tabs Help
[aditya@glitchinamatrix 180905350]$ cc p33.c
[aditya@glitchinamatrix 180905350]$ cat >xyz.txt
hi bye
[aditya@glitchinamatrix 180905350]$ ./a.out xyz.txt
Number of hard links:1
abc.txt a.out p1.c p2.c p33.c p3.c p4.c xyz.txt
Linking..
Number of hard links:2
New path:random.txt
abc.txt a.out p1.c p2.c p33.c p3.c p4.c random.txt xyz.txt
Unlinking...
Number of hard links after unlinking:1
abc.txt a.out p1.c p2.c p33.c p3.c p4.c random.txt
[aditya@glitchinamatrix 180905350]$
```

```
File Edit View Terminal Tabs Help
[aditya@glitchinamatrix 180905350]$ cat random.txt
hi bye
```

Q4)

```
#include<sys/types.h>
#include<sys/stat.h>
#include<unistd.h>
#include<stdio.h>
#include <inttypes.h>
#include<stdlib.h>
void main(int argc, char* argv[])
{
    if(argc<2)
    {
        printf("Insufficient arguments\n");
        return;
    }
    char new_path[100]="random2.txt";
    struct stat start;
    int ret1 = stat(argv[1],&start);
    system("ls");
    printf("Linking..\n");
    int ret2 = symlink(argv[1],new_path);
    struct stat intermediate;
    int ret3 = stat(argv[1],&intermediate);
    printf("New path:%s\n",new_path);
    system("ls");
    int ret4 = unlink(argv[1]);
    struct stat ending;
    int ret5 = stat(new_path,&ending);
    printf("Unlinking...\n");
    system("ls");
}
```

Output

```
File Edit View Terminal Tabs Help
[aditya@glitchinamatrix 180905350]$ cc p4.c
[aditya@glitchinamatrix 180905350]$ cat >h.txt
hello
[aditya@glitchinamatrix 180905350]$ ./a.out h.txt
abc.txt a.out h.txt p1.c p2.c p33.c p3.c p4.c random.txt
Linking..
New path:random2.txt
abc.txt a.out h.txt p1.c p2.c p33.c p3.c p4.c random2.txt random.txt
Unlinking...
abc.txt a.out p1.c p2.c p33.c p3.c p4.c random2.txt random.txt
[aditya@glitchinamatrix 180905350]$ ls
abc.txt a.out p1.c p2.c p33.c p3.c p4.c random2.txt random.txt
[aditya@glitchinamatrix 180905350]$ cat random2.txt
cat: random2.txt: No such file or directory
[aditya@glitchinamatrix 180905350]$
```