Write up for Question 2

Steps followed for compiling the kernel and adding system call:

1. Download kernel source code using wget command

   wget https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.17.4.tar.xz

2. Extract the tar.gz file using

   sudo tar -xvf linux-4.17.4.tar.xz -C/usr/src/

3. Goto to directory kernel/ in the extracted folder

   `cd /usr/src/linux-4.17.4/`

4. Edit file sys.c, ex : sudo nano sys.c

```
SYSCALL_DEFINE4(kernel_2d_memcpy , float**, matrix1, float**, matrix2, int, row, int ,column)
{
    float mat[row][column];

    long copied = __copy_from_user(mat, matrix1, row*column);

    if (copied < 0 || copied == row*column)
        return -EFAULT;

    long ret = __copy_to_user(matrix2, mat, row*column);

    if (ret < 0 || ret == row*column)
        return -EFAULT;

    printk(KERN_INFO "kernel_2d_memcpy syscall executed successfully !!");

    return copied;
}
```

5. Add your syscall code in the file sys.c

6. Go to directory arch/x86/entry/syscalls/ in the extracted folder

7. Add your system call to file syscall_64.tbl

   Ex: 440 common sample sys_sample

```
544     x32      io_submit                __x32_compat_sys_io_submit
545     x32      execveat                 __x32_compat_sys_execveat/ptregs
546     x32      preadv2                  __x32_compat_sys_preadv64v2
547     x32      pwritev2                 __x32_compat_sys_pwritev64v2
548     common   kernel_2d_memcpy         sys_kernel_2d_memcpy
```

8. Edit config file so that only required things are compiled
   ```
   sudo make menuconfig
   ```
9. Compile the kernel with sudo make -j($number of processors to use)

   ```
   sudo make -jn
   ```
10. Install modules using : sudo make modules_install install

    ```
    sudo make modules_install install
    ```

11. Reboot system

Output of the demo file

```
harjeet@DESKTOP-UJ6GBK8:/mnt/c/Users/Harjeet/Desktop/OS_assig$ gcc demo.c -o demo
harjeet@DESKTOP-UJ6GBK8:/mnt/c/Users/Harjeet/Desktop/OS_assig$ ./demo
Making system call with matrix1 and matrix 2
System call returned 0.
Console Output: Success
Matrix 2 : - After system call
1 2
3 4
harjeet@DESKTOP-UJ6GBK8:/mnt/c/Users/Harjeet/Desktop/OS_assig$
```