Operating Systems (Lab)

Final Exam Time allowed: Entire exam slot.

• It is a closed notes and book exam

• All questions are mandatory

Question 1 [20]

Somewhere near Lahore, there is a gaming arena and three gamers. They all want to play games, but the problem is that the system is disassembled. All the three following parts must be available in order to play games:

1. Graphic Card
2. Power Cable
3. Random Access Memory

Role of Manager in Gaming Arena

The manager has all the parts with infinite supply required to play the game but has space concerns. The manager can only provide two random parts at one instant. The manager can only provide the next two parts if and only if any gamer has played the game and signaled the manager.

Role of Gamers

Three Gamers are present each with one disassembled part with infinite supply.

o Gamer A has a Graphic
Card o   Gamer B has a
Power Cable o Gamer   C
has a RAM

A gamer can only play the game if and only if he can get all the three parts and switch on the system. Gamer A needs a power cable and RAM, Gamer B needs a Graphic Card and Ram while Gamer C needs a Graphic Card and Power Cable. Once any gamers get

all three disassembled parts, he can play the game and signal the manager that he has played the game, so the manager can send another supply of any two random parts.

A) Implement the scenario using POSIX Threads where number of games played will be entered as command-line argument. Make threads and call their respective functions correspondingly. You do not
need to synchronize the threads in this part.(You only need to print message in the functions in part A)

Output Format:./main.out 2

Creating 4 threads

Creating Gamers Thread
Creating Gamer A with Graphic Card
Gamer A Requires Power Cable and RAM
Gamer A Ending

Creating Gamer B with Power Cable
Gamer B needs a Graphic Card and Ram
Gamer B Ending

Creating Gamer C with RAM
Gamer C needs a Graphic Card and Power Cable
Gamer C Ending

Creating Manager Thread
Creating Manager Thread with infinite supply
Manager has Graphic Card, Power Cable, and RAM
The manager will provide any two parts at any instant.
Manager will send the next supply after he gets a signal from any
gamer Manager thread is ending

Note: The output sequence will be random, just make sure the number of outputs is same

B) Implement the complete scenario carrying on with part A, to overcome the deadlock situation and starvation. Write down the deadlock and starvation conditions in comments at the start of the code.

Question 2 [20]

Write a Multi-threaded C program in which user pass a String as command line argument and your program will create two threads.

- One thread will change all lowercase letters to uppercase letters and return the string to the main thread.
- The second thread will change all Upper case to lower case of original string and return the string to main thread.

The Main thread will print the final answers to both changes. You may create as many helping functions you need. (10).

Sample 1:
./a.out Ali Asghar
Thread 1 working
ALI ASGHAR
Thread 2 working
ali asghar

Sample 2:
./a.out Saboor
Thread 1 Working
SABOOR
Thread 2 Working
saboor

Hint: ASCII of small letters range (97-112). ASCII of capital letters range (65-90)