National University of Computer and Emerging Sciences, Lahore Campus

Course:	Data Structures Lab	Course Code:	CL218
Program:	BS(Computer Science)	Semester:	Spring 2022
Duration:	2 hours	Total Marks:	90
Paper Date:	11-Apr-2022	Weight	30%
Section:	BCS-4G	Page(s):	
Exam:	Midterm	Roll No:	

Instruction/Notes:

- **We will check your code for plagiarism.** If plagiarism is found, it will result in **F grade** in lab.
- **In case of any ambiguity make suitable assumption.**
- No cell phones are allowed. Sharing of **USBs** or any other items is **not allowed.**
- You are not allowed to have any helping code with you.
- **Submission path is \\cactus1\Xeon\Spring 2022\Fraz Yousaf\Data Structure\BCS4G\MidTermExamSubmission\SectionG1/G2(Submit your code in your respective section.**
- **The file containing the ProcessFile is placed on Xeon: \\cactus\Xeon\Spring 2022\Fraz Yousaf\Data Structures MidTermExamSection\ProcessFile**
- **For submission you will rename main.cpp with your roll number and then you will submit it on cactus.**

Question 1: **(60 marks)**

1. A CPU can execute many processes. However, at a given time, a cpu can execute the instructions of only one process (not true for modern CPUs, nonetheless). To manage the execution of n processes, we make use of what is known as "CPU Scheduler". We will write a basic type of scheduler which will work as follows: Suppose we have 10 processes named p1, p2,....,p10. Each process has some number of instructions n1, n2, n3.....n10, respectively. Now to execute all the processes, we first execute some instructions, let's say 3 instructions of process p1, and then we will execute 3 instructions of p2, so on and so forth. After that we will restart from process p1 and execute 3 instructions of p1, then p2, then p3, so on and so forth. Then the cycle begins again. So, the processes are being executed by CPU in circular fashion. If a process has finished its instructions during this cycle, then we remove that process from this cycle. The given example below depicts the scenario:

   Suppose we have 3 processes:
   Process_id: p1
   Total_Instructions: 7

   Process_id: p2
   Total_Instructions 6

   Process_id: p3
   Total_Instructions 5

   Scheduler Output:
   3 instructions of p1 executed.

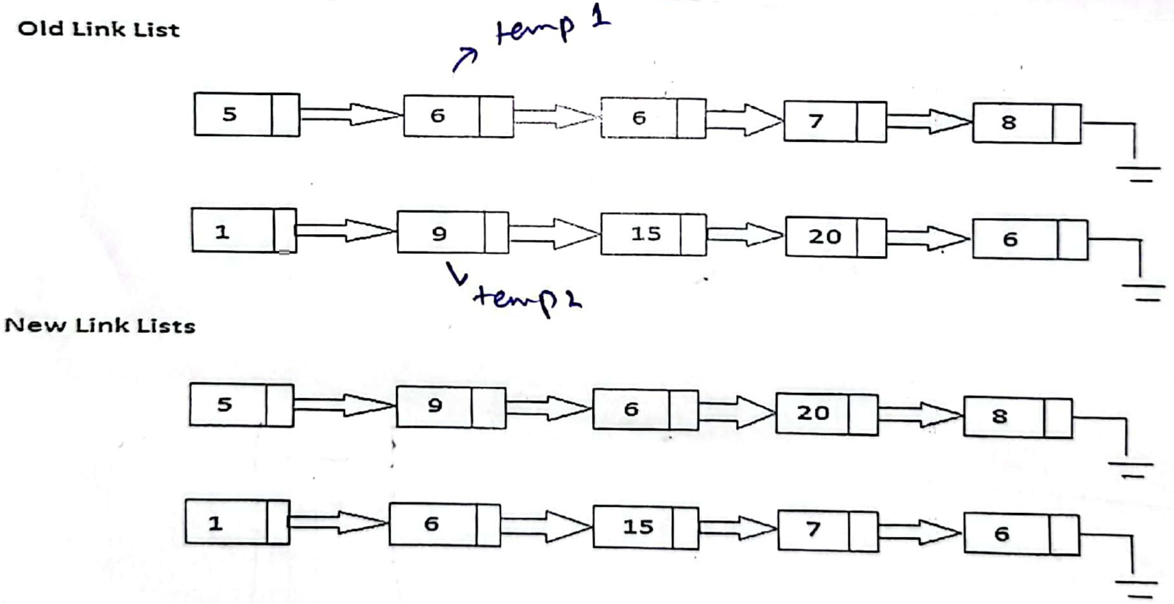
3 instructions of p2 executed.
3 instructions of p3 executed.
3 instructions of p1 executed.
3 instructions of p2 executed.
p2 has finished execution.
2 instructions of P3 executed.
p3 has finished execution.
1 instruction of p1 executed.
p1 has finished execution.

Implement your scheduler function using the queue . The function will take a file name as argument. The file contains information about all the processes to be executed. A sample file is also given. The first number in the file tells about the number of instructions that the CPU will execute, of a process p, at one time. The second number tells us about the total number of processes in the file. Test your function in main with the given file.

void scheduler(string processFile);

Question 2: (40 marks)

Consider two linked lists as shown in figure A your task is to swap the data of every second element of the link lists as shown in figure B. Once you have done with that print the old link lists as well the new link lists. An illustration is given below



Note: You need to solve this in a single traversal and just need to use these two link list(No more than 2).You are required to write the print function in recursive manner.