Operating Systems (Lab)
Final Exam
Time allowed: Entire exam slot
Fall-2022

Instructions

- It is a **closed** notes and book exam
- All questions are mandatory

Task 1: (Marks 20)

Write a program that receives two command-line arguments, N and M, such that N >= M. The program calculates the factorial of N using the M number of threads. Each thread should display its product. The main thread calculates the final product.

Example: $./a.out 5 2

Output

Factorial by Thread#1 : 20

Factorial by Thread#2 : 6

The factorial is: 120

Task 2: (Marks 20)

Thread synchronization using semaphores: The "NaCl" problem: You've been hired by Mother Nature to help with the chemical reaction to form Salt, which she doesn't seem to be able to get right due to synchronization problems. The trick is to get one Na (Sodium) atom and one Cl (Chlorine) atom all together at the same time. The atoms are threads. Each Na atom thread executes a procedure NReady() when it is ready to react; and each Cl atom thread invokes a procedure CReady() when it is ready.

Your job is to write the code for NReady() and CReady(). The procedures must delay until there are at least one Na atom and one Cl atom present, and then one of the procedures must call the procedure makeSalt(). After the makeSalt() call, instance of NReady() and instance of CReady() should return.