COIS 4470H: Modelling and Simulation
Winter 2023

Assignment 1

Due: Tuesday, January 31, 2023

1. Situation: You are the system administrator for a company that uses ten servers to support its Business. Every morning at 9:00am the servers are re-booted for the day's business. With the following two cases, your boss wants you to find the percentage of days that the company can have its business on time. Write simulation programs to help you determine the percentage.

Case I: No back up server. If one or more of the ten servers fail on boot-up, the company cannot do the business until the failed server(s) are fixed.

Probability of a server failing boot-up	1%	2%	3%
Percentage of days business on time			

Case II: On top of the ten servers, have one more server as back up. If one the ten servers fail on boot-up, the back up server can be used. So the company still can have its business on time. But if more than two servers fail on boot-up, business cannot be on time.

Probability of a server failing boot-up	1%	2%	3%
Percentage of days business on time			

2. Newspaper seller's problem: In class, we discussed the optimization problem for the newspaper seller by simulation. Complete the simulation program to find the optimal number for system performance. Run your program to simulate the system for 1000, 10000, and 100000 days.

Simulation Results for the Newspaper Seller's system

Number of Newspapers	40	50	60	70	80	90	100	Optimal number
1000 days								
10000 days								
100000 days								

maximum delay = create a new field for this in the sum and use max function with current delay
proportions of jobs delayed = keep a counter that increases in the if statement of delays

3. A single server queue simulation:

(a) Modify program **ssq1.c** by adding the capability to compute the **maximum delay**, the **proportion of jobs delayed** and the **number of jobs** in the system at a **specified time** (known at compile time).

(b) Use the following data as inputs, what was the maximum delay experienced? What proportion of jobs was delayed? How many jobs were in the system at time t=300?

a_i (arrival time)	s_i (service time)
15	43
47	36
71	34
111	30
123	38
152	40
166	31
226	29
310	36
320	30

(c) Use the input file ssq1.dat for your program, what was the maximum delay experienced? What proportion of jobs was delayed? How many jobs were in the system at time t=2000 and 6000 respectively?

Guidelines

(a) Source code is provided in C and can be downloaded from Blackboard. You can use any computer program for the simulation.

(b) Give all your answers and discussions in a pdf file named: yourLastName-A1. Submit both the answer file and all programs on Blackboard by 11:59pm on the due date.