Queueing Model Assignment

Class Lecture Link:
https://drive.google.com/file/d/1GT2cSLhDDj0pab1g0wMkMy_TWfACXFVo/view?usp=sharing
Class code Link:
https://colab.research.google.com/drive/1Z_V0NX5HBJWaZHhHPUCwkYaMtM4Py4BV?usp=sharing

Assignment Task:
You have to implement a queueing model. The model has 2 servers and 1 queue. Let's say we have server-1 and server-2.
The arrival of customer: If both servers are idle, the customer will go to server-1. If any of the servers are idle and the other one is busy then the customer will go to Idle sever. If both servers are busy then the customer will stand on the queue.
The departure of a customer: Departure can occur from any of the servers. Then the next customer from the queue will be chosen according to queue policy (FIFO, LIFO or SJF). [See the class lecture for solution hint]

Tasks:

1. Print clock_value, server_status of both servers, arrival list of queue, service times in queue, next_arrival time, next_departure time of both servers, total delay, area_under_q(t), area_under_b(t) for both servers at each clock step.
2. We have to implement SJF, LIFO. Report average_delay, expected number of customers in the queue, expected utilization of the server-1 and sever-2 for each queue policy.
3. Important: **You cannot make separate files for each queue policy. You have to submit just one .py file. You can input a variable in your code to choose the queue policy.** As for example 1 for FIFO, 2 for SJF and 3 for LIFO.
4. You can use the given Inter-arrivals and service times in your code.
   Inter-arrival Times: A 1 = 0.4, A 2 = 1.2, A 3 = 0.5, A 4 =1.7, A 5 = 0.2, A 6 = 1.6, A 7 = 0.2, A 8 = 1.4, A 9 = 1.9, A10 = 0.7
   Service times are: S 1 = 2.0, S 2 = 0.7, S3 = 0.2, S4 = 1.1, S5 = 3.7, S6 = 0.6
5. Then take inter-arrival and service times randomly from exponential distribution of mean = 1/3 for inter-arrival times and mean = 1/4 for service times. You can use **np.random.exponential()** function from python to do this job. (use np.random.seed(0) for consistent values)

6. Prepare a **report** like below:

Take Interarrival times = exponential with mean 1/3

Take Service times = exponential with mean 1/4

Run the Simulation for 3 cases: num_delays until 10, 50 and 100 customers.

And fill up the following table for each case.

Performance Measure	FIFO	LIFO	SJF
Average Delay			
Expected Number of Customers in the queue			
Expected Utilization of the server-1			
Expected Utilization of the server-2			

Submission Instructions:

1. There will be 2 submission links. In one link, you have to upload your code (.py file) and you have to upload your report(.pdf) on another link.

2. Don't copy codes. Codes will be checked against Plagiarism software. Any kind of copy detected will result in negative marks.
3. There will be viva in the last 2 labs. You may be asked to explain or change your code during the viva. The marking of this assignment will be evaluated after the viva.
4. Viva schedule and instructions will be announced later.