Group 2
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Assignment 3

Question 2

Part 2.1:

CPU log output for the SRTF scheduler (workload3, quantum=2) is shown below:

0: Arrival of Task 12 (ready queue length = 1)
0: Run Task 12 for duration 2 (ready queue length = 0)
1: Arrival of Task 13 (ready queue length = 1)
2: Arrival of Task 14 (ready queue length = 2)
2: IO wait for Task 12 for duration 1
2: Run Task 14 for duration 1 (ready queue length = 1)
3: Arrival of Task 15 (ready queue length = 2)
3: Wakeup of Task 12 (ready queue length = 3)
3: IO wait for Task 14 for duration 2
3: Run Task 12 for duration 2 (ready queue length = 2)
5: Wakeup of Task 14 (ready queue length = 3)
5: Run Task 14 for duration 1 (ready queue length = 2)
6: Run Task 15 for duration 2 (ready queue length = 1)
8: Run Task 15 for duration 1 (ready queue length = 1)
9: Run Task 13 for duration 2 (ready queue length = 0)
11: Run Task 13 for duration 2 (ready queue length = 0)
13: Run Task 13 for duration 2 (ready queue length = 0)
15: Run Task 13 for duration 1 (ready queue length = 0)
16: Stop

Part 2.2:

CPU log output for the MLFQ scheduler (workload3, low priority queue quantum=4, high priority queue quantum = 2) is shown below:

0: Arrival of Task 12 (ready queue length = 1)
0: Run Task 12 for duration 2 (ready queue length = 0)

1: Arrival of Task 13 (ready queue length = 1)
2: Arrival of Task 14 (ready queue length = 2)
2: IO wait for Task 12 for duration 1
2: Run Task 13 for duration 2 (ready queue length = 1)
3: Arrival of Task 15 (ready queue length = 2)
3: Wakeup of Task 12 (ready queue length = 3)
4: Run Task 14 for duration 1 (ready queue length = 3)
5: IO wait for Task 14 for duration 2
5: Run Task 15 for duration 2 (ready queue length = 2)
7: Wakeup of Task 14 (ready queue length = 3)
7: Run Task 12 for duration 2 (ready queue length = 3)
9: Run Task 14 for duration 1 (ready queue length = 2)
10: Run Task 13 for duration 4 (ready queue length = 1)
14: Run Task 15 for duration 1 (ready queue length = 1)
15: Run Task 13 for duration 1 (ready queue length = 0)
16: Stop

Note: The implementation of the SRTF and the MLFQ schedulers by our team passes all the test cases given in the jupyter notebook.

Question 3 on the next page

Question 3

Range of values of lambda taken = 0.02 - 0.099

Part (a):
Let us take the value of T as 20 (service_time in the code). The mean time between the arrivals is given by 1/ƛ (inverse of the lambda/arrival rate).

To make T = 1/ƛ, the value of lambda/arrival rate should be 1/20 = 0.05. Thus, the **value of $ƛ_M$** is **0.05.**

Part (b):
For the value of service time T=20, we get 50% for **ƛ=0.025**, as seen in the following graph:

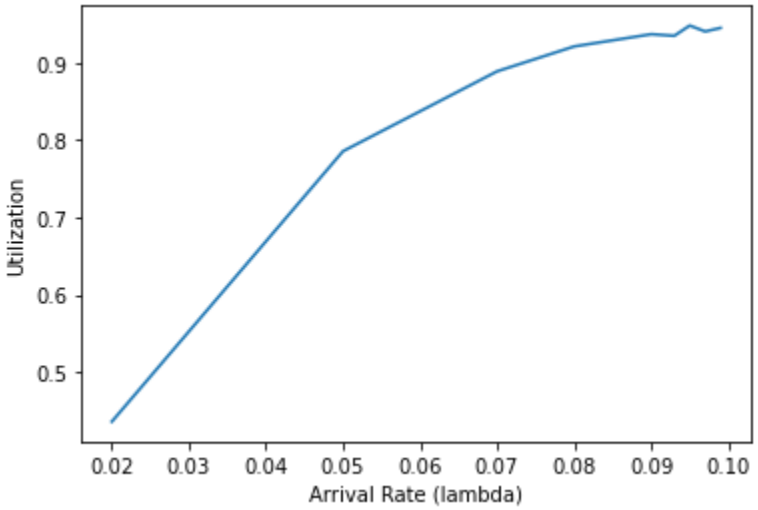

Figure: Utilization plot for the system

To make the system run at 50% utilization for variable service time, we guess that the service time should be half of the mean time between two tasks. Hence, it should satisfy the following criteria:

Service_time (T) = 0.5/ƛ

This fact is also confirmed by the following utilization plot:

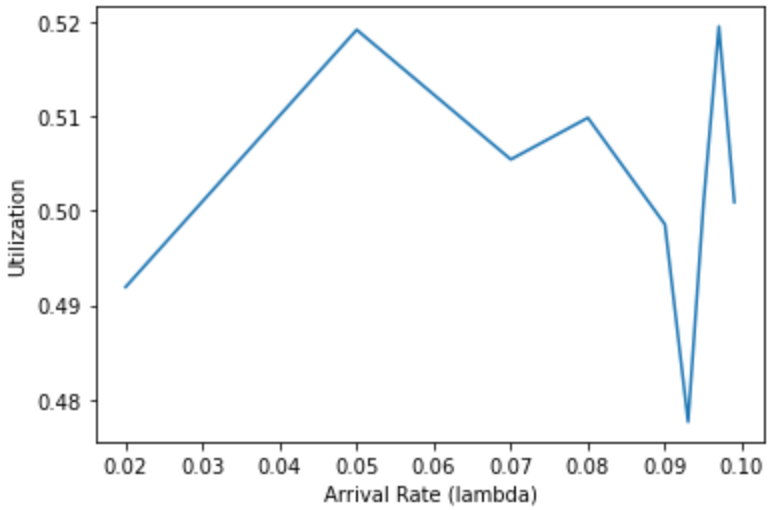

Figure: 50% utilization plot for the system

The utilization is nearly 50% for all values of ƛ in the above plot.

Part (c):
Plot of utilization against different values of ƛ is given by:

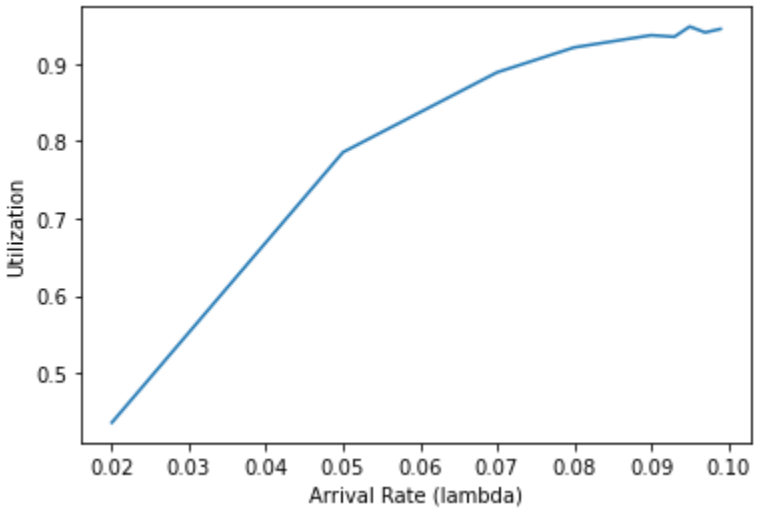

Figure: CPU utilization corresponding to different values of lambda

As can be seen from the above figure, as we increase the value of the arrival rate (lambda), the utilization increases.

Part (d):
Plot of response time against different values of ƛ is given by:

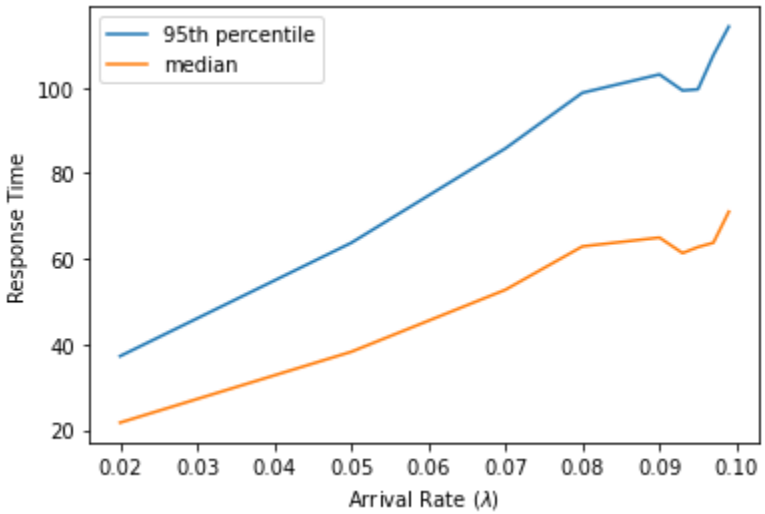

Figure: Response time corresponding to different values of lambda

As can be seen from the above figure, as we increase the value of the arrival rate (lambda), both the median and the 95th percentile response time increases.