CS 301: Assignment 3

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2. Implementing Scheduling Algorithm

2.1 Shortest Remaining Time First

Jupyter Cell:

```
_ = srtf(workload3, 2, True)
```

Output Log:

```
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
```

2.2 Multilevel Feedback Queue

Jupyter Cell:

```
_ = mlfq2(workload3, 2, 4, True)
```

Output Log:

```
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
```

3. Approaching 100% Utilization

3.1 What is the value of λ_M ?

Ans: 0.6 (approx.)

3.2 What value of λ should we choose, such that the system runs at 50% utilization on average?

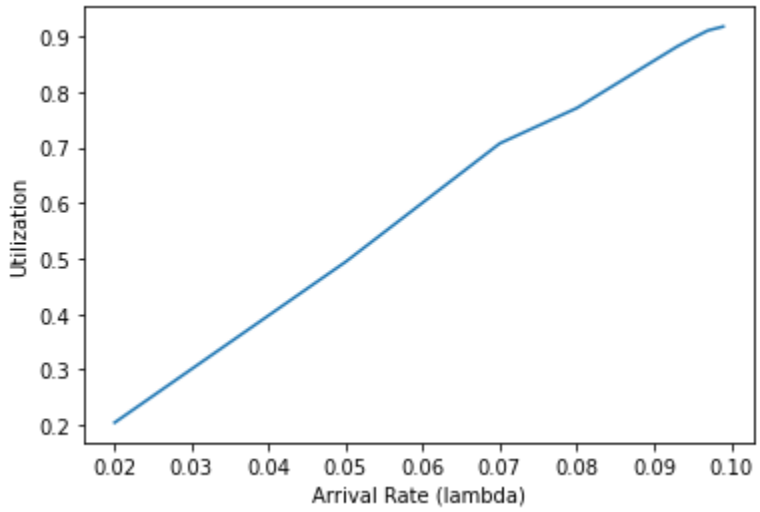
Ans: Value of lambda for 50% utilization is **0.051** (Calculated from the Utilization vs Lambda plot using Linear regression).

3.3 As you vary λ, what happens to CPU utilization?

Ans: As we increase λ, CPU utilization increases.

3.4 Show a line plot with the arrival rate on the x axis and CPU utilization on the y axis, depicting the results.

Ans:



3.5 As you vary λ, what happens to the response time for each CPU burst?
Ans: As λ increases, the response time also increases.

3.6 Show a line plot with the arrival rate on the x-axis and response time on the y axis, depicting the results.