CS350-HW5- Fall 2020

easyabi

November 2020

1 Question 1

1.1 a:

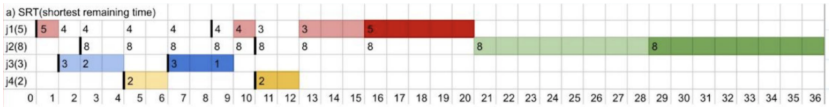

Figure 1: SRT

1.2 b:

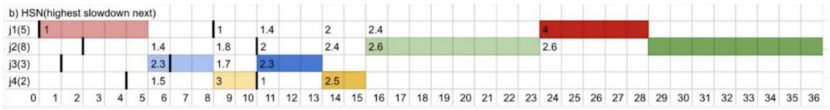

Figure 2: HSN

1.3 c:

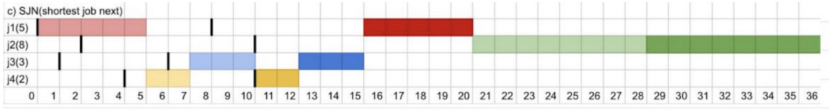

Figure 3: SJN

1.4 d:

Figure 4: RR

1.5 e

$$SRT = \frac{15 + 12 + 26 + 26 + 3 + 3 + 2 + 2}{8} = 11.1$$

$$HSN = \frac{5 + 20 + 21 + 26 + 7 + 7 + 6 + 5}{8} = 12.1$$

$$SJN = \frac{5 + 12 + 26 + 26 + 9 + 9 + 3 + 2}{8} == 11.5$$

$$RR = \frac{12 + 22 + 31 + 26 + 7 + 10 + 12 + 9}{8} = 17.4$$

SRT yields a better performance regarding the average response time

1.6 f

If we consider the slowdown for the shortest job as metric of fairness
Slowdown for J4 under SRT = 4/4= 1
Slowdown for J4 under S4 = 11/4 = 2.75
Slowdown for J4 under SJN = 5/4 = 1.25
Slowdown for J4 under RR = 20/4 = 5
Therefore, SRT achieves better fairness

2 Question 2

2.1 a:

The scheduling policy is FCFS; therefore, it is non-preemptive. It is a work-conserving scheduler.

2.2 b:

$$\lambda_{in} = 326600\, Trans/hour = 0.09072\, Trans/ms$$

$$Ts = \frac{15 + 11 + ... + 9}{30} = 8.9ms$$

$$Tq = \frac{Ts}{1 - \lambda Ts} = \frac{8.9}{1 - 0.09072 \times 8.9} = 46.2$$

2.3 c:

$$S = \frac{(15 - 8.9)^2) + ... + (-8.9)^2}{30 - 1} = 3.03$$

$$E = Z_{\frac{\alpha}{2}} \times \frac{S}{\sqrt{N}}$$

$$1.5 = Z_{\frac{\alpha}{2}} = 2.709$$

using the table:

$$Z_{\frac{\alpha}{2}} = 0.99664 = 1 - \frac{\alpha}{2} \longrightarrow \alpha = 0.993$$

2.4 d:

We know q in M/M/1 system depends and the arrival rate and service rate. Here arrival rate is known. Therefore, Error in q is determined by error is service time

$$\alpha = 1 - 0.99 = 0.01 \longrightarrow 1 - \alpha/2 = 0.995$$

using Z table , we have :

$$Z_{\frac{\alpha}{2}} = 2.58$$

$$E = Z_{\frac{\alpha}{2}} \times \frac{\alpha}{\sqrt{N}} = v2.58 * \frac{\sqrt{9.196}}{\sqrt{30}} = 1.428$$

Thus, the Ts interval is:

$$[7.47, 10.32]$$

We know that:

$$q = \frac{\lambda Ts}{1 - \lambda Ts}$$

$$q' = \frac{0.0907 \times 10.32}{1 - 0.09 \times 10.32} = 14.8$$

Therefore, the confidence interval is :
[2.1, 14.8711]

2.5 e:

Lets first find n, the number of samples we need to reach the desired confidence interval:

$$n = (\frac{Z_{\frac{\alpha}{2}}}{E})^2$$

$$\alpha = 1 - 0.9996 \longrightarrow 1 - \alpha/2 = 0.9998$$

Using Z table:

$$Z\frac{\alpha}{2} = 3.54$$

$$n = (\frac{3.54 \times 3.032}{1})^2 = 116$$

And finally the amount needed to obseve the system to get 116 samples is as follows :

$$n/\lambda = 116/90.72 = 1.279 seconds$$

2.6 f

We quantify correlation for different values of d

d=4 yields to the highest possible correlation. The correlation for d=4 is -0.548. Therefore, there is pattern and its periodicity equal to 4

3 Question 3

3.1 a

Job parameters:

j_i	a_i	C_i
$j_{1.1}$	0	3
$j_{2.1}$	1	5
$j_{3.1}$	3	2
$j_{4.1}$	5	6
$j_{5.1}$	7	2
$j_{1.2}$	10	1
$j_{3.2}$	11	4

Figure 5:

3.2 b

SRT

3.3 c

At this time a new job of j3 arrives with remaining execution time of 4. Therefore, the scheduler has to make a decision choosing the next job to execute. Since j2's job has a lower remaining time, the scheduler chooses to schedule j2's job.

3.4 d

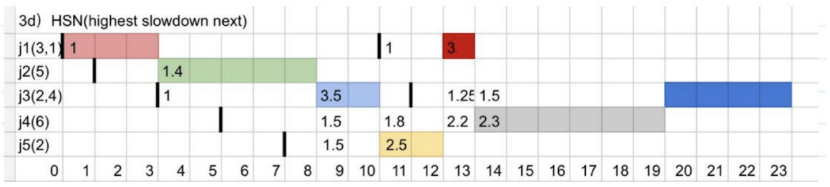

Figure 6: HSN

3.5 e

Yes, consider two jobs j1 and j2. j1 has execution time of 1000000 and arrives at time 0 and j2 has a execution time of 2 and arrives at time 1. The scheduler at time 0 has no choice but choosing job j1. Hence, the slowdown down of j2 which is a short job is notably high and therefore not fair.