

CS350 Assignment 5

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Written Part

Problem 1

a) Everything is divided by 10 so instead of 10 I will use 1.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
SRT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
j1	8	7	7	7	7	7	7	7	7	7	7	7	7	7	7-6.5	6.5	5.5	4.5	3.5	2.5	1.5	0.5
j2		3																				
j3		3.5	3.5	3.5	3.5																	
j4								2-1.5	1.5	0.5												
j5									5	4-4.5	4.5	3.5	2.5	1.5	0.5							

$$\text{Average response time} = \frac{21.5+3+6.5+2.5+6.5}{5} = 8$$

b) Everything is divided by 10 so instead of 10 I will use 1.

RR	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16	16.5	17	17.5	18	18.5	19	19.5	20	20.5	21	
j1		8		7																																								
j2				3		3																																						
j3				3.5			3.5																																					
j4																2																												
j5																		5																										

$$\text{Average response time} = \frac{20.5+9+12+8+13.5}{5} = 12.6$$

c) Everything is divided by 10 so instead of 10 I will use 1.

HSN	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
j1		8																				
j2			3							3												
j3			3.5									3.5										
j4								2							2							
j5									5								5					

$$\text{Average response time} = \frac{8+10+13.5+9.5+13.5}{5} = 10.9$$

d) Everything is divided by 10 so instead of 10 I will use 1.

SJN	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
j1	8																					
j2		3									3											
j3		3.5												3.5								
j4								2	2													
j5									5								5					

Average response time = $\frac{8+12+15.5+3+13.5}{5} = 10.4$

e) SRT has the lowest average response time.

f) SRT has the better fairness because it has the lowest slowdown.

SRT: $\frac{2.5}{2} = 1.25$

RR: $\frac{8}{2} = 4$

HSN: $\frac{9.5}{2} = 4.75$

SJN: $\frac{3}{2} = 1.5$

Problem 2

a)

Job ID	Arrival Time	Job Length
$j_{1,1}$	0	2
$j_{1,2}$	4	3
$j_{1,3}$	12	2
j_2	1	6
j_3	4	3
$j_{4,1}$	5	1
$j_{4,2}$	13	3
$j_{5,1}$	9	2
$j_{5,2}$	17	2
j_6	11	6

b) SRT because it is preemptive and chooses the shortest remaining time next in the processor.

c) **time 4** = $j_{1,2}$ has 3 left. j_2 has 4 left. j_3 arrives and has 3 left therefore it starts while j_2 is paused. j_3 could've been randomly chosen.

time 5 = $j_{1,2}$ has 3 left. j_2 has 4 left. j_3 has 3 left. $j_{4,1}$ arrives and has 1 left therefore it starts while j_2 and j_3 are paused.

time 8 = $j_{1,2}$ has 3 left. j_2 has 4 left. Therefore $j_{1,2}$ starts while j_2 is paused.

time 11 = $j_{5,1}$ has 2 left. j_2 has 4 left. j_6 arrives and has 6 left. Therefore $j_{5,1}$ starts while j_2 and j_6 are paused.

time 13 = $j_{1,3}$ has 2 left. j_2 has 4 left. j_6 has 6 left. $j_{4,2}$ arrives and has 3 left. Therefore $j_{1,3}$ starts while $j_{4,2}$, j_2 and j_6 are paused.

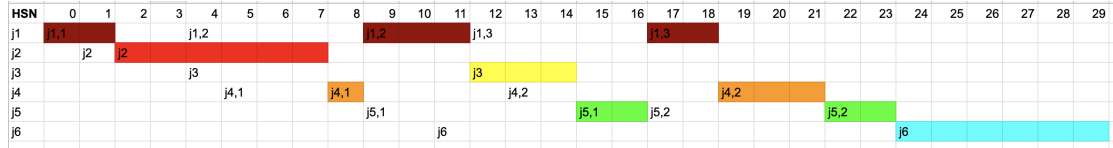
time 20 = j_2 has 4 left. j_6 has 6 left. Therefore j_2 starts while j_6 is paused.

d) Average response time = $\frac{2+7+3+23+4+1+5+4+3+19}{10} = 7.1$

Fairness for $j_{4,1} = \frac{1}{1} = 1$

e) Slowdown for $j_2 = \frac{23}{6} = 3.834$

f)



g) Average response time = $\frac{2+8+7+7+11+4+9+8+7+19}{10} = 8.2$ Fairness for $j_{4,1} = \frac{4}{1} = 4$

HSN is worse than SRT

Problem 3

a)

I/Os end from 1910 to 1919

$$\rightarrow \frac{1010+1910+1911+1912+1913+1914+1915+1916+1917+1918+1919}{11}$$

The average turn around time for Q=500 is 1832.27

I/Os end from 1190 to 1199

$$\rightarrow \frac{1090+1190+1191+1192+1193+1194+1195+1196+1197+1198+1199}{11}$$

The average turn around time for Q=100 is 1185

I/Os end from 1110 to 1119

$$\rightarrow \frac{1100+1110+1111+1112+1113+1114+1115+1116+1117+1118+1119}{11}$$

The average turn around time for Q=20 is 1113

I/Os end from 1000 to 1009

$$\rightarrow \frac{1100+1000+1001+1002+1003+1004+1005+1006+1007+1008+1009}{11}$$

The average turn around time for Q=1 is 1013

b) Slowdown CPU-bound job

For Q=500 is $\frac{1010}{1000}$

For Q=100 is $\frac{1090}{1000}$

For Q=20 is $\frac{1100}{1000}$

For Q=1 is $\frac{1000}{1000}$

Average slowdown is sum of all slowdown divided by 4 which equals to 1.075

c) Slowdown I/O-bound job

For Q=500 is $\sum_{i=1910}^{1919} \frac{i}{1000}$

For Q=100 is $\sum_{i=1190}^{1199} \frac{i}{1000}$

For Q=20 is $\sum_{i=1110}^{1119} \frac{i}{1000}$

For Q=1 is $\sum_{i=1000}^{1009} \frac{i}{1000}$

Average slowdown is sum of all slowdown divided by 4 which equals to 1.307

d) Utilization of the I/O devices. (How often the I/O devices use the CPU)

For Q=500 is $\frac{100}{1919}$

For Q=100 is $\frac{100}{1199}$

For Q=20 is $\frac{100}{1119}$

For Q=1 is $\frac{100}{1009}$

e) FIFO

Slowdown for A: 1

Slowdown for B: 2

Slowdown for C: 4.63

f) RR

Slowdown for A: 1.95

Slowdown for B: 2.05

Slowdown for C: 2.09

g) Virtual RR

Slowdown for A: 1.95

Slowdown for B: 2.05

Slowdown for C: 1.36

h) SRT

Slowdown for A: 1.05

Slowdown for B: 2.05

Slowdown for C: 1