

Exercise

For a given operating systems the processes are executed with preemptive scheduling and using a cyclic (round-robin) policy.

The following table shows, for each process, its related arrival time and execution time. All the processes only perform compute (cpu-intensive) operations.

Process	Arrival time	Execution time
P1	0	500
P2	100	300
P3	300	400
P4	600	1000
P5	700	600

We want to evaluate the effect in the scheduling when the time slice length is changed. The considered time slice values are 200 and 500 milliseconds.

For each considered value, complete the following tasks:

1. Determine at what time ends each process.
2. Determine the time that each process was running (turnaround time).
3. Determine the service and wait time for each process of each process.
4. Determine the normalized turnaround time.
5. Determine the average waiting time.
6. Determine the average turnaround time.

Solution

T (slice 200)	CPU	Queue
0	P1<500>	
100	P1<400>	P2<300>
200	P2<300>	P1<300>
300	P2<200>	P1<300>, P3<400>
400	P1<300>	P3<400>, P2<100>
600	P3<400>	P2<100>, P4<1000>, P1<100>
800	P2<100>	P4<1000>, P1<100>, P5<600>, P3<200>
900 – P2 ends	P4<1000>	P1<100>, P5<600>, P3<200>
1100	P1<100>	P5<600>, P3<200>, P4<800>
1200 – P1 ends	P5<600>	P3<200>, P4<800>
1400	P3<200>	P4<800>, P5<400>
1600 – P3 ends	P4<800>	P5<400>
1800	P5<400>	P4<600>
2000	P4<600>	P5<200>
2200	P5<200>	P4<400>
2400 – P5 ends	P4<400>	
2800 – P4 ends		

Process	Tarrive	Tend	Tturnaround	Trun	Twait	Tturn(norm)
P1	0	1200	1200	500	700	$1200/500 = 2,4$
P2	100	900	800	300	500	$800/300 = 2,67$
P3	300	1600	1300	400	900	$1300/400 = 3,25$
P4	600	2800	2200	1000	1200	$2200/1000 = 2,2$
P5	700	2400	1700	600	1100	$1700/600 = 2,83$
Average					880	2,67

T (slice 500)	CPU	Queue
0	P1<500>	
100	P1<400>	P2<300>
300	P1<300>	P2<300>, P3<400>
500 – P1 ends	P2<300>	P3<400>
600	P2<200>	P3<400>, P4<1000>
700	P2<100>	P3<400>, P4<1000>, P5<600>
800 – P2 ends	P3<400>	P4<1000>, P5<600>
1200 – P3 ends	P4<1000>	P5<600>
1700	P5<600>	P4<500>
2200	P4<500>	P5<100>
2700 – P4 ends	P5<100>	
2800 – P5 ends		

Process	Tarrive	Tend	Tturnaround	Trun	Twait	Tturn(norm)
P1	0	500	500	500	0	$500/500 = 1$
P2	100	800	700	300	400	$700/300 = 2,33$
P3	300	1200	900	400	500	$900/400 = 2,25$
P4	600	2700	2100	1000	1100	$2100/1000 = 2,1$
P5	700	2800	2100	600	1500	$2100/600 = 3,5$
Average					700	2,23