

Chapter 5

5.4 Consider the following set of processes, with the length of the CPU-burst time given in milliseconds:

Process	Burst Time	Priority
P_1	10	3
P_2	1	1
P_3	2	3
P_4	1	4
P_5	5	2

The processes are assumed to have arrived in the order P_1, P_2, P_3, P_4, P_5 , all at time 0.

- Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF, a nonpreemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 1) scheduling.
- What is the turnaround time of each process for each of the scheduling algorithms in part a?
- What is the waiting time of each process for each of the scheduling algorithms in part a?
- Which of the schedules in part a results in the minimal average waiting time (over all processes)?

Answer:

a. Gantt Charts

FCFS

P1	P2	P3	P4	P5
1 2 3 4 5 6 7 8 9 10	11	12 13	14	15 16 17 18 19

SJF

P2	P4	P3	P5	P1
1 2 3 4	5 6 7 8 9 10	11 12 13 14 15 16 17 18 19		

Non-preemptive Priority

P2	P5	P1	P3	P4
1 2 3 4 5 6	7 8 9 10 11 12 13 14 15 16	17 18 19		

RR(quantum=1)

P1	P2	P3	P4	P5	P1	P3	P5	P1	P5	P1	P5	P1	P5	P1	P1	P1	P1	P1
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

b. Turnaround Time

Process	FCFS	SJF	NPP	RR(quantum=1)
P1	10	19	16	19
P2	11	1	1	2
P3	13	4	18	7
P4	14	2	19	4

P5	19	9	6	14
Average	13.4	7.2	12	9.2

c. Waiting Time

Process	FCFS	SJF	NPP	RR(quantum=1)
P1	0	9	6	9
P2	10	0	0	1
P3	11	2	16	5
P4	13	1	18	3
P5	14	4	1	9
Average	9.6	3.2	8.2	5.4

d. According to the average waiting time shown in the table above, Shortest Job First has the minimal average waiting time over all processes.

5.5 Which of the following scheduling algorithms could result in starvation?

- a. First-come, first-served
- b. Shortest job first
- c. Round robin
- d. Priority

Answer: Shortest job first and priority-based scheduling algorithms could result in starvation.

5.11 Using the Windows XP scheduling algorithm, what is the numeric priority of a thread for the following scenarios?

- a. A thread in the REALTIME PRIORITY CLASS with a relative priority of HIGHEST.
- b. A thread in the NORMAL PRIORITY CLASS with a relative priority of NORMAL.
- c. A thread in the HIGH PRIORITY CLASS with a relative priority of ABOVE NORMAL.

Answer:

- a. 26
- b. 8
- c. 14

5.0 Assume three processes P1, P2, and P3:

P1 consists of one thread T11

P2 consists of three threads T21, T22, and T23

P3 consists of two threads T31 and T32.

The following are the CPU bursts for these processes and their threads:

PROCESS	THREADS	CPU BURST
P1	T11	7
P2	T21	4
	T22	2
	T23	4
P3	T31	6
	T32	3

Assume that all threads arrive at the same time 0.

Show the execution of these processes using Round-Robin scheduler and $T_q=5$ time units:

(1) If the threads are user-level threads

(2) If the threads are kernel (OS) supported threads.

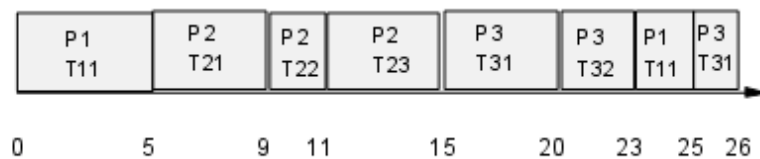
Calculate the waiting times (T_w) and turnaround times (T_{tr}) for each process and their average values for both cases (1) and (2).

ANS:

User-level threads



Kernel (OS) supported threads



User-level threads

Kernel-supported threads

Processes	T_w	T_{tr}	T_w	T_{tr}
P1	10	17	18	25
P2	12	22	5	15
P3	17	26	17	26
Average	13	21.67	13.33	22