Process Scheduling Examples

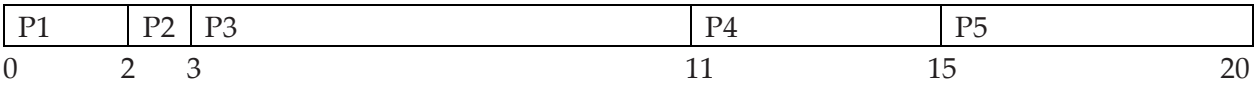
Question 1: Consider the following set of processes, with the length of the CPU burst given in milliseconds:

Process	Burst Time	Priority
P1	2	2
P2	1	1
P3	8	4
P4	4	2
P5	5	3

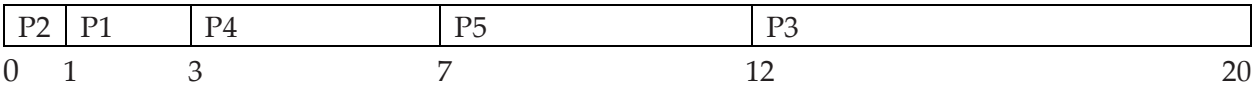
The processes are assumed to have arrived in the order *P*1, *P*2, *P*3, *P*4, *P*5, all at time 0.

a. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: **FCFS**, **SJF**, **non-preemptive priority** (a larger priority number implies a higher priority), and **RR** (quantum = 2).

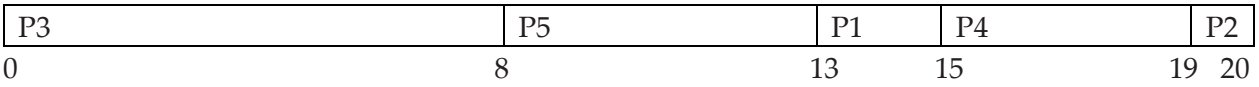
FCFS:



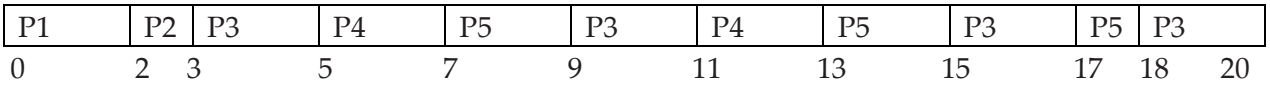
SJF:



non-preemptive priority:



RR:



b. What is the **turnaround time** of each process for each of the scheduling algorithms in part a?

FCFS:
P1=2 P2=3 P3=11 P4=15 P5=20
SJF:
P1=3 P2=1 P3=20 P4=7 P5=12
non-preemptive priority:
P1=15 P2=20 P3=8 P4=19 P5=13
RR:
P1=2 P2=3 P3=20 P4=13 P5=18

c. What is the **waiting time** of each process for each of these scheduling algorithms?

FCFS:
P1=0 P2=2 P3=3 P4=11 P5=15
SJF:
P1=1 P2=0 P3=12 P4=3 P5=7
non-preemptive priority:
P1=13 P2=19 P3=0 P4=15 P5=8
RR:
P1=0 P2=2 P3=12 P4=9 P5=13

d. Which of the algorithms results in the minimum average waiting time (over all processes)?

FCFS:
0+ 2+ 3+11+15 =31/5 = 6.2
SJF:
1+0 +12 +3 +7 =23/5= 4.6
non-preemptive priority:
13 +19 +0 +15 +8=55/5=11
RR:
0 +2 +12 +9 +13=36/5= 7.2

SJF has the least average waiting time

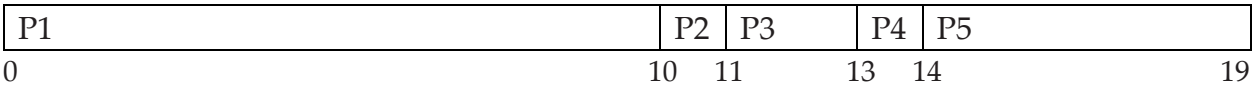
Question 2: Consider the following set of processes, with the length of the CPU burst given in milliseconds:

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

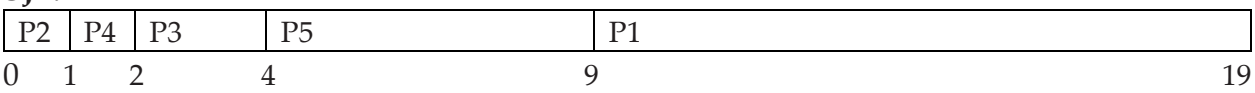
The processes are assumed to have arrived in the order *P*1, *P*2, *P*3, *P*4, *P*5, all at time 0.

a. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: **FCFS**, **SJF**, **non-preemptive priority** (a smaller priority number implies a higher priority), and **RR** (quantum = 1).

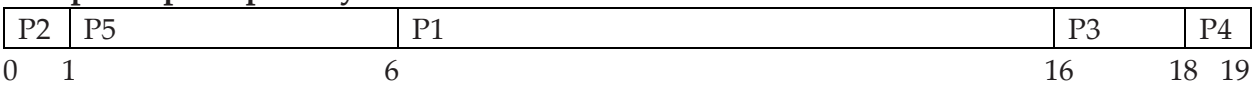
FCFS:



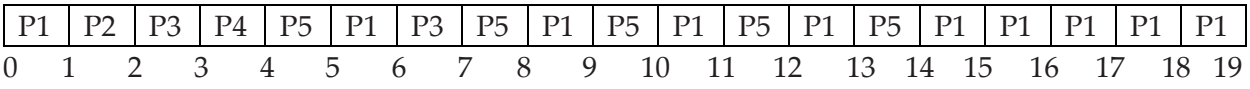
SJF:



non-preemptive priority:



RR:



b. What is the **turnaround time** of each process for each of the scheduling algorithms in part a?

FCFS:
P1=10 P2=11 P3=13 P4=14 P5=19
SJF:
P1=19 P2=1 P3=4 P4=2 P5=9
non-preemptive priority:
P1=16 P2=1 P3=18 P4=19 P5=6
RR:
P1=19 P2=2 P3=7 P4=4 P5=14

c. What is the **waiting time** of each process for each of these scheduling algorithms?

FCFS:
P1=0 P2=10 P3=11 P4=13 P5=14
SJF:
P1=9 P2=0 P3=2 P4=1 P5=4
non-preemptive priority:
P1=6 P2=0 P3=16 P4=18 P5=1
RR:
P1=9 P2=1 P3=5 P4=3 P5=9

d. Which of the algorithms results in the minimum average waiting time (over all processes)?

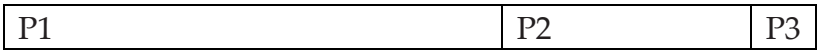
FCFS:
0+10+11+13+14 = 48/5 = 9.6
SJF:
9+0+2+1+4 = 16/5 = 3.2
non-preemptive priority:
6+0+16+18+1 = 41/5 = 8.2
RR:
9+1+5+3+9 = 27/5 = 5.4

SJF has the least average waiting time

Question 3: Suppose that the following processes arrive for execution at the times indicated. Each process will run for the amount of time listed. In answering the questions, use **non-preemptive scheduling**, and base all decisions on the information you have at the time the decision must be made.

Process	Arrival time	Burst Time
P1	0.0	8
P2	0.4	4
P3	1.0	1

a. What is the **average turnaround time** for these processes with the **FCFS** scheduling algorithm?

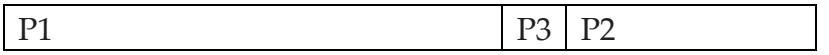


0 8 12 13

P1=8 P2=12-0.4=11.6 P3=13-1=12

average turnaround time = 8+11.6+12 = 31.6/3 = 10.5333333

b. What is the **average turnaround time** for these processes with the **SJF** scheduling algorithm?



0 8 9 13

P1=8 P2=13-0.4=12.6 P3=9-1=8

average turnaround time = 8+12.6+8 = 28.6/3 = 9.5333333