CSCE 5640: Operating System Design

Homework-2

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3. (40) Consider the following set of processes, with the length of the CPU burst time given in milliseconds:

Process	Burst Time	Priority
*P*1	2	2
*P*2	1	1
*P*3	9	4
*P*4	4	2
*P*5	6	3

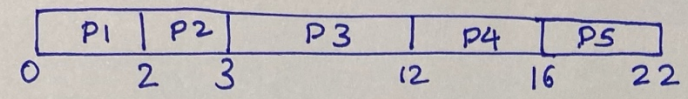
The processes are assumed to have arrived in the order *P*1, *P*2, *P*3, *P*4, *P*5, all at time 0.

a. Draw four Gantt charts that illustrate the execution of these processes using the following scheduling algorithms: FCFS, SJF, nonpreemptive priority (a smaller priority number implies a higher priority), and RR (quantum = 2).
b. What is the turnaround time of each process for each of the scheduling algorithms in part a?
c. What is the waiting time of each process for each of these scheduling algorithms?
d. Which of the algorithms results in the minimum average waiting time (over all processes)?

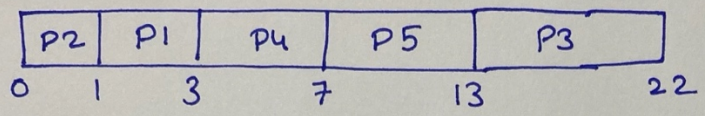
Ans:

a.

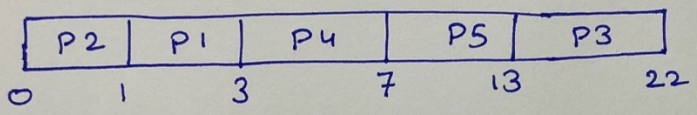
FCFS



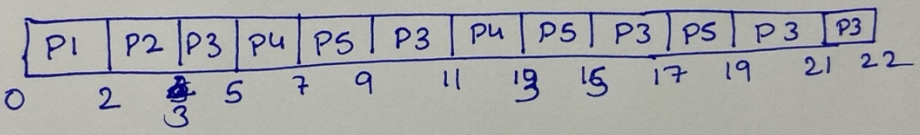
SJF



Non-Preemptive Priority



RR(q=2)



P1: 20

P2: 10

P3: 9 7 8 3 10

P4: 4 20

P5: 6 4 20

b) Turn arrond time = Completion Time - Arrival Time.

	P1	P2	P3	P4	P5
FCFS	2	3	12	16	22
SJF	3	1	22	7	13
Priority	3	1	22	7	13
RR	2	3	22	13	19

c) Waiting time = Turnaround time - Burst time.

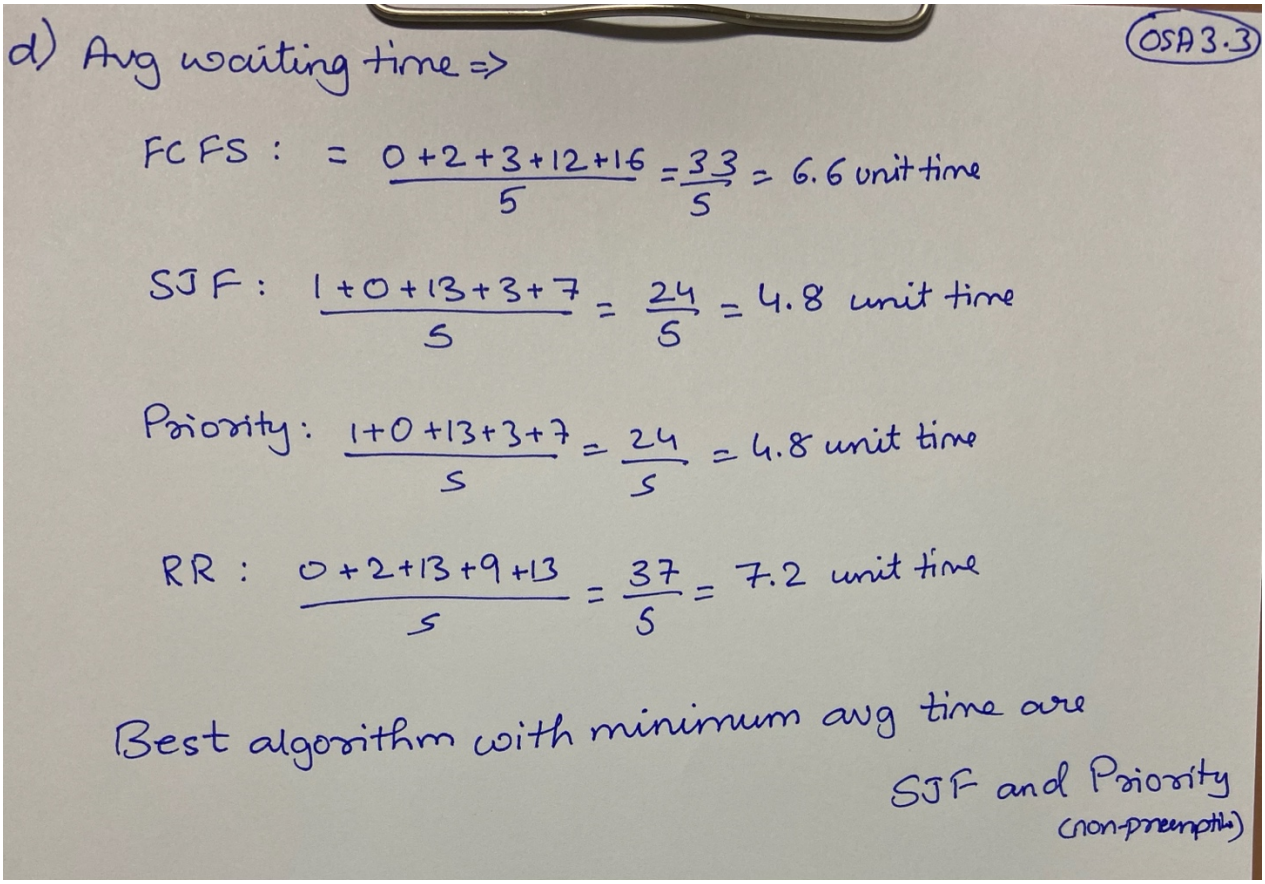
	P1	P2	P3	P4	P5
FCFS	0	2	3	12	16
SJF	1	0	13	3	7
Priority	1	0	13	3	7
RR	0	2	13	9	13

RR

P3: 3+(9-5)+(15-11)+(19-17) = 13

P4: 5+(11-7) = 9

P5: 7+(13-9)+(17-15) = 13



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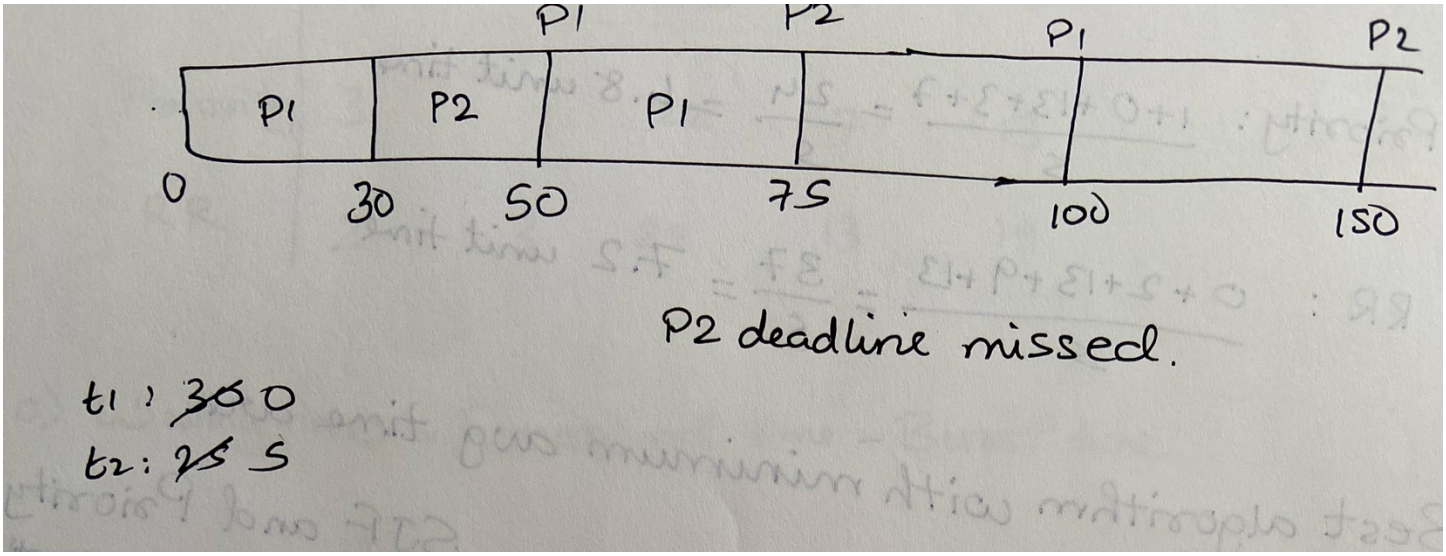
4. (20) Consider two processes, *P*1 and *P*2, where *P*1 has a period of *p*1 = 50 and CPU burst *t*1 = 30. For *P*2, the corresponding values are *p*2 = 75, and *t*2 = 25.
   a) Can these two processes be scheduled using rate-monotonic scheduling? Illustrate your answer using a Gantt chart such as the ones in Figure 5.21–Figure 5.24.
   b) Illustrate the scheduling of these two processes using earliest-deadline-first (EDF) scheduling.

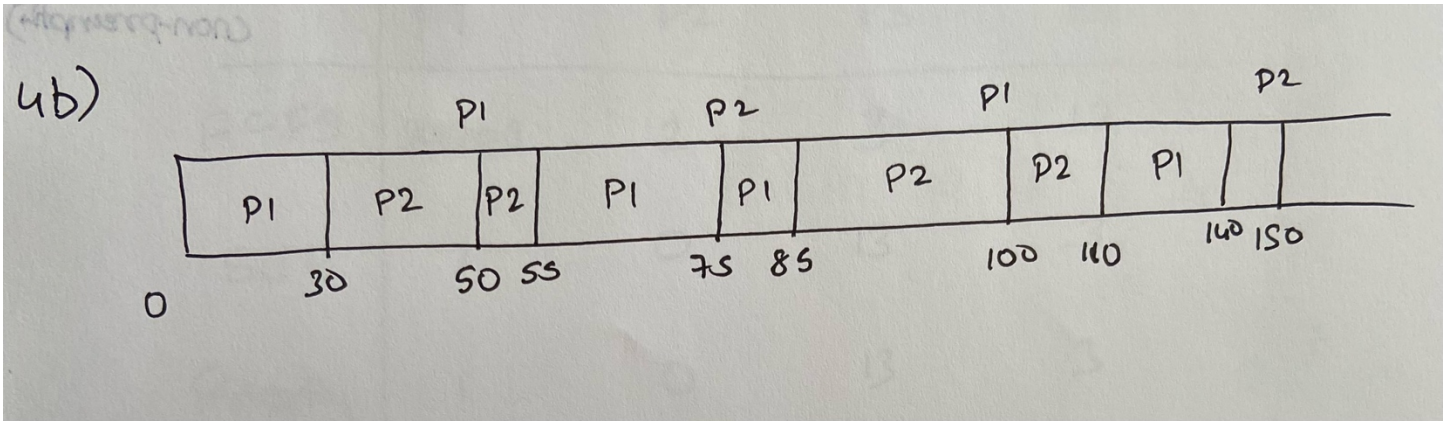
Ans:

a.

The deadline is missed for P2. So, the two processes cannot be scheduled using rate-monotonic scheduling.


P1
P2
P1
P2
P1
P2
0
30
50
75
100
150
P2 deadline missed.
t1 : 30 0
t2 : 25 5

b.


4b)
P1
P2
P1
P2
P1
P2
P2
P1
P1
P2
P2
P1
0
30
50
55
75
85
100
110
140
150