DEPARTMENT OF SOFTWARE ENGINEERING

THE UNIVERSITY OF LAHORE

Assignment 2

Due Date: Friday 25 March 2022

1- Round robin schedulers normally maintain a list of all runnable processes, with each process occurring exactly once in the list. What would happen if a process occurred twice in the list? Can you think of any reason for allowing this?

A process will get more quanta per scheduling cycles. This is used to give more important process a larger share of the CPU.

2- Most round robin schedulers use a fixed size quantum. Give an argument in favor of a small quantum. Now give an argument in favor of a large quantum.

A large quantum is more efficient than a small one, since fewer process switches happen this way. However, interactive response time suffers. Interactive processes prefer smaller quantum.

3- 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 P1, P2, P3, P4, P5, all at time 0.

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

(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 the scheduling algorithms in part a?

(d) Which of the schedules in part a results in the minimal average waiting time (over all processes)?

Answer:

a. The four Gantt charts are

1	2	3	4	5	FCFS

0 10 11 13 14 19

1	2	3	4	5	1	3	5	1	5	1	5	1	5	1	RR

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 19

2	4	3	5	1	SJF

0 1 2 4 9 19

2	5	1	3	4	Priority

0 1 6 16 18 19

b. Turnaround time

	FCFS	RR	SJF	Priority
P_1	10	19	19	16
P_2	11	2	1	1
P_3	13	7	4	18
P_4	14	4	2	19
P_5	19	14	9	6

c. Waiting time (turnaround time minus burst time)

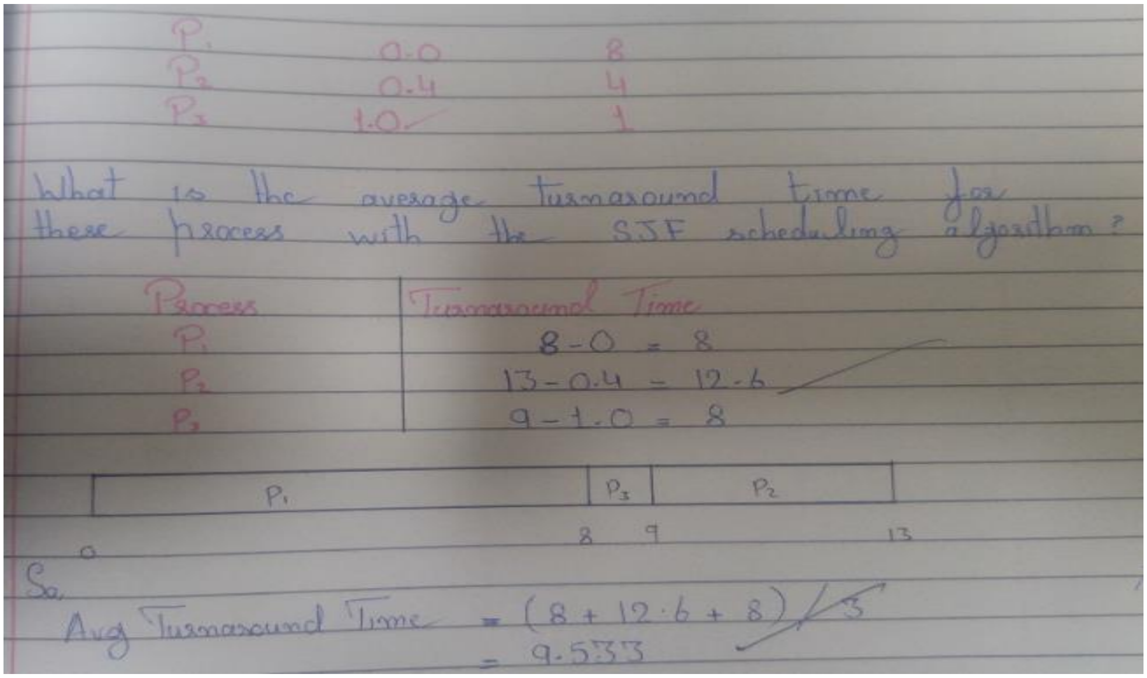
	FCFS	RR	SJF	Priority
P_1	0	9	9	6
P_2	10	1	0	0
P_3	11	5	2	16
P_4	13	3	1	18
P_5	14	9	4	1

d. Shortest Job First

4- Suppose that the following processes arrive for execution at the times indicated. Each process will run the listed amount of time. 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
P_1	0.0	8
P_2	0.4	4
P_3	1.0	1

(a) What is the average turnaround time for these processes with the SJF scheduling algorithm?



P1	0.0	8
P2	0.4	4
P3	1.0	1

What is the average turnaround time for these process with the SJF scheduling algorithm?

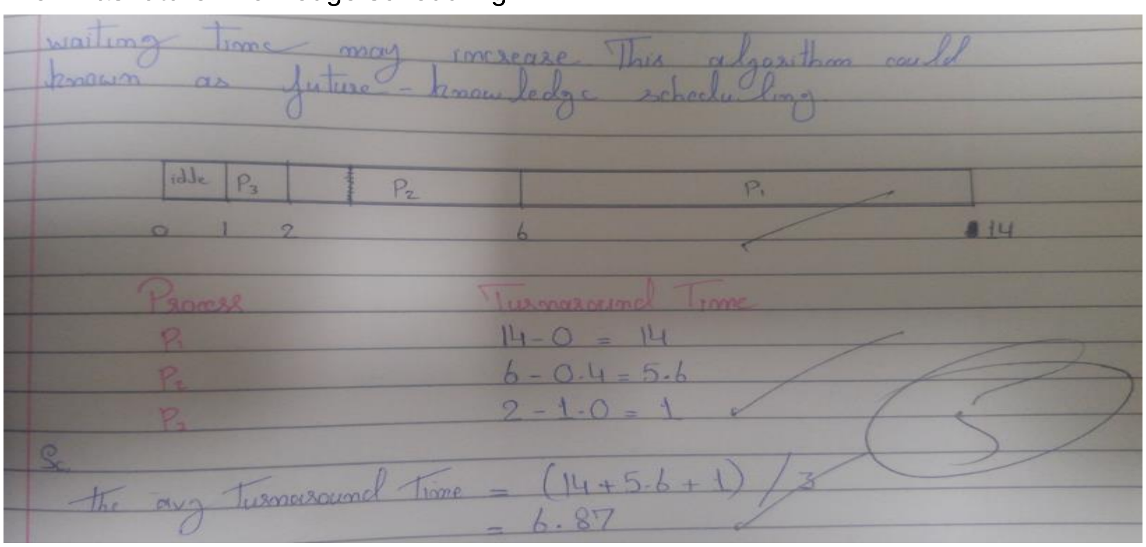
Process	Turnaround Time
P1	8 - 0 = 8
P2	13 - 0.4 = 12.6
P3	9 - 1.0 = 8

P1	P3	P2
0	8	9 – 13

So,

Avg Turnaround Time = (8 + 12.6 + 8) / 3
= 9.533

(b) The SJF algorithm is supposed to improve performance, but notice that we chose to run process P1 at time 0 because we did not know that two shorter processes would arrive soon. Compute what the average turnaround time will be if the CPU is left idle for the first 1 unit and then SJF scheduling is used. Remember that processes P1 and P2 are waiting during this idle time, so their waiting time may increase. This algorithm could be known as future-knowledge scheduling.



waiting time may increase. This algorithm could known as future-knowledge scheduling

idle	P3	P2	P1
0	1	2	6 – 14

Process	Turnaround Time
P1	14 - 0 = 14
P2	6 - 0.4 = 5.6
P3	2 - 1.0 = 1

So

the avg Turnaround Time = (14 + 5.6 + 1) / 3
= 6.87

Remember that turnaround time is finishing time minus arrival time, so you have to subtract the arrival times to compute the turnaround times. FCFS is 11 if you forget to subtract arrival time.

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

Process	Burst
P1	10
P2	4
P3	8
P4	4
P5	7

The processes are assumed to have arrived in the order P1< P2 < P3< P4< P5

(a) Draw Gantt chart that illustrates the execution of these processes using FCFS scheduling algorithm.

P1	P2	P3	P4	P5	
0	10	14	22	26	23

(b) What is the turnaround and average waiting time in part (a)?

TAT
P1=10
P2=14
P3=22
P4=26
P5=33
Average TAT = 21

WT
P1=0
P2=10
P3=14
P4=22
P5=26

Average WT= 0+10+14+22+26/5=14.4

(c) If the processes execution change to P2< P3 < P4< P5< P1, what is the turnaround and average waiting time?

P2	P3	P4	P5	P1

0 4 12 16 23 33

TAT
P2=4
P3=12
P4=16
P5=23
P1=33
Average TAT = 17.6
WT
P2=0
P3=4
P4=12
P5=16
P1=23

Average WT= 0+4+12+16+23/5=11

(d) If the processes execution change to P3< P1 < P5< P4< P2, what is the turnaround and average waiting time?

P3	P1	P5	P4	P2

0 8 18 25 29 33

TAT
P3=8
P1=18
P5=25
P4=29
P2=33
Average TAT = 22.6
WT
P3=0
P1=8
P5=18
P4=25
P2=29
Average WT= 0+8+18+25+29/5=16

(e) Explain the optimal execution sequence from P1< P2 < P3< P4< P5, P2< P3 < P4< P5< P1 and P3< P1 < P5< P4< P2

P2< P3 < P4< P5< P1 is an optimal sequence