CSE/IT Batch : Hinglish

Operating System
CPU Scheduling Part - 1

DPP NO: 1

1. Consider 3 processes P_1, P_2, and P_3, arrival time and I/O bursts and CPU bursts of these process are given in the below table. Note that each process has their own I/O resource.

Process	Arrival	Burst Duration		
		BT	I/O	BT
P_1	0	2	7	4
P_2	1	5	5	2
P_3	2	3	4	2

The operating system uses FCFS scheduling calculate the finish time of process P_1, P_2 & P_3

(a) 14, 16, 18 (b) 14, 18, 20
(c) 13, 17, 18 (d) 13, 17, 19

[NAT]

2. Consider the following CPU processes with arrival times (in milliseconds) and length of CPU bursts (in milliseconds) as given below

Process	Arrival Time	Burst Time
P_1	0	8
P_2	2	4
P_3	4	6
P_4	5	3

If the non-preemptive shortest job first algorithm is used to schedule the process, then average waiting time across all process is ___ milliseconds.

[NAT]

3. Consider the following CPU processes with arrival times (in milliseconds) and length of CPU bursts (in milliseconds) as given below.

Process	Arrival Time	Burst Time
P_1	0	8
P_2	2	4
P_3	4	6
P_4	5	3

If the preemptive shortest first algorithm is used to schedule the processes, then average waiting time across all process is ___ milliseconds.

4. Consider the following set of processes, with the given arrival, CPU burst times in milliseconds

Process	Arrival Time	Burst Time
P_1	0	6
P_2	3	4
P_3	4	8
P_4	6	3

What is the average turnaround time for these processes with the pre-emptive shortest remaining processing time first (SRPT) algorithm?

(a) 3.5 milliseconds (b) 9.5 milliseconds
(c) 0 milliseconds (d) 9

5. Consider three processes P0, P1, P2 with burst time 2, 4 and 6 units and the processes arrives at time 0, 0, 0 respectively. Consider the longest remaining time first (non-preemptive) scheduling algorithm. Find Average completion time of processes.

(a) 11.66 units (b) 9 units
(c) 12 units (d) 9.33 units

6. Consider the three processes P1, P2 and P3 with burst time 2, 4 & 6 units, all the process arrive at time zero. Consider the longest remaining time first (LRTF) / (LJF) (Preemptive) scheduling algorithm in LRTF/ LJF, ties are broken by giving priority to the process having lowest process id (PID). What is average waiting time?

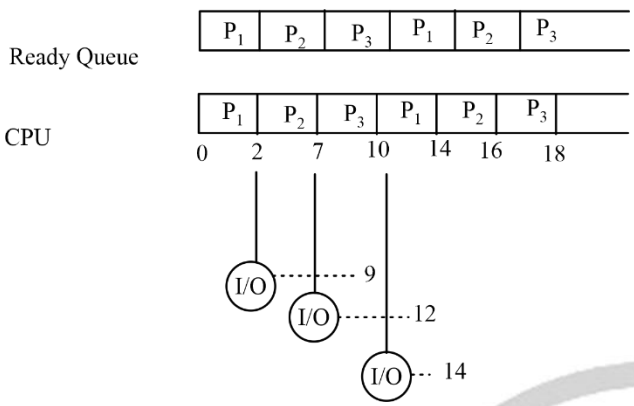
(a) 6 (b) 5.33
(c) 6.33 (d) 7.33

Answer Key

1. **(a)**
2. **(5.75 milliseconds)**
3. **(4.75)**
4. **(d)**
5. **(d)**
6. **(c)**

Hints & Solutions

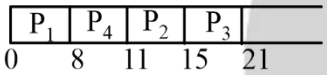
1. (a)



Finish Times of $P_1 = 14$
$P_2 = 16$
$P_3 = 18$

2. (5.75 milliseconds)

Gantt Chart



Arrival time (AT)	Burst Time (BT)	Compiler Time (CT)	Turnaround Time (TaT)	Waiting Time (W.T)
0	8	8	8	0
2	4	15	13	9
4	6	21	17	11
5	3	11	6	3

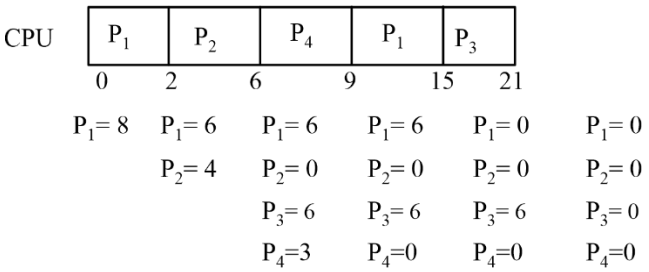
TaT = CT – AT
WT = TaT – BT

Average WT = $\frac{0 + 9 + 11 + 3}{4}$

= 5.75 milliseconds

3. (4.75)

Gantt chart:



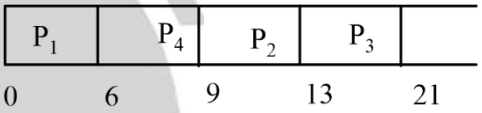
Process	AT	BT	CT	TAT	WT
P_1	0	8	15	15	7
P_2	2	4	6	4	0
P_3	4	6	21	17	11
P_4	5	3	9	4	1

TAT = CT – AT
WT = TAT – BT

Average Waiting time = $\frac{7 + 0 + 11 + 1}{4}$

= 4.75 milliseconds

4. (d)



AT	BT	CT	TAT	WT
0	6	6	6	0
3	4	13	10	6
4	8	21	17	11
6	3	9	3	0

Average WT = $\frac{0 + 6 + 11 + 0}{4} = \frac{18}{4}$ = 4.5 milliseconds

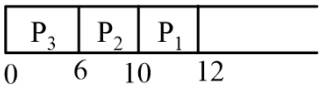
Average TAT = $\frac{6 + 10 + 17 + 3}{4}$ = 9 milliseconds

TAT = CT – AT
WT = TAT – BT

5. (d)

Process	AT	BT	CT
P1	0	2	12
P2	0	4	10
P3	0	6	6

Gantt Chart:



Average Completion time = $\frac{12+10+6}{3} = 9.33$ units

6. (c)

Process	AT	BT	CT	TAT	WT
P1	0	2	9	9	7
P2	0	4	10	10	6
P3	0	5	11	11	6

Gantt Chart:

P_3	P_2	P_3	P_2	P_3	P_1	P_2	P_3	P_1	P_2	P_3

P_1=2 P_1=2 P_1=2 P_1=2 P_1=2 P_1=2 P_1=1 P_1=1 P_1=1 P_1=0 P_1=0 P_1=0

P_2=4 P_2=4 P_2=3 P_2=3 P_2=2 P_2=2 P_2=2 P_2=1 P_2=1 P_2=1 P_2=0 P_2=0

P_3=5 P_3=4 P_3=4 P_3=3 P_3=3 P_3=2 P_3=2 P_3=2 P_3=1 P_3=1 P_3=1 P_3=0

TAT = CT – AT

WT = TAT – BT

Average Waiting Time = $\frac{7+6+6}{3} = 6.33$ units