Branch : CSE & IT **Batch : Hinglish**

Operating System

CPU Scheduling

DPP 03

[MCQ]

1. Consider the following statements:

(i) SJF is the most optimal algorithm among all other scheduling algorithms.

(ii) SRTF is practically non-implementable because it is pre-emptive in nature.

(iii) SJF is practically implementable because of it's non-premptive nature.

Which of the following is CORRECT?

(a) Only (i) and (ii).
(b) Only (ii) and (iii).
(c) All (i), (ii), and (iii).
(d) None of these.

[MCQ]

2. Consider the set of processes.

Process	Arrival time	Burst time
A	2	3
B	4	17
C	2	4
D	1	2
E	7	5

Assume that the processes are scheduled using the non-pre-emptive Shortest Job First(SJF) algorithm. What are the average turnaround time and average waiting time?

(a) 13.5, 5.25 (b) 10.0, 3.8
(c) 12.2, 5.6 (d) 8.75, 4.25

[MCQ]

3. A Scheduler that selects partially executed processes from a secondary storage device is called______.

(a) Medium-term scheduler.
(b) Short term scheduler.
(c) Long Term scheduler.
(d) None of these.

[NAT]

4. Consider arrival time and execution time for the following processes that need to be scheduled on a single CPU.

Process	Arrival time	Burst time
P0	0	3
P1	2	5
P2	3	4
P3	4	2
P4	6	1
P5	6	2

What is the sum of throughput of the system and average waiting time if SRTF Scheduling is used? (upto 2 decimal)

[MCQ]

5. Consider the given process table:

Process	Arrival time	Burst time
P0	6	8
P1	0	6
P2	2	4
P3	3	6
P4	4	1
P5	5	2

Consider the context switching overhead of 1 unit. What is the percentage of CPU overhead activity while using SRTF scheduling for the processes given in the above table? Include the context switching to load the first process, and save the last process.

(a) 20.5% (b) 23.5%
(c) 25% (d) 27.6%

[MSQ]

6. Which of the following statement(s) is/are correct in the context of CPU scheduling?

(a) Turnaround time includes waiting time.

(b) SRTF can be used even when the CPU time required by each of the processes is not known apriori.

(c) Implementing preemptive scheduling may need hardware support.

(d) The goal is to only maximize CPU utilization and minimize throughput.

[NAT]

7. Consider the following five processes, with their arrival times and execution times given in milliseconds.

Process	Arrival time	Burst time
P0	1	3
P1	0	2
P2	4	4
P3	3	6
P4	6	2

Using Non - pre-emptive Shortest Job First, what will be the average waiting time? [upto 1 decimal point]

[MCQ]

8. Which of the following scheduler can control degree of multiprogramming?

(a) Medium-term scheduler.
(b) Short term scheduler.
(c) Long Term scheduler.
(d) None of these.

Answer Key

1. **(d)**
2. **(b)**
3. **(a)**
4. **(3.01)**
5. **(c)**
6. **(a, c)**
7. **(2.6)**
8. **(c)**

Hint & Solutions

1. (d)

(i) SJF is the most optimal algorithm among all other scheduling algorithms. CORRECT.

(ii) SRTF is practically non-implementable because it is pre-emptive in nature. SRTF is non-implementable because predicting burst time of a process before it's execution is not possible. INCORRECT

(iii) SJF is practically implementable because of it's non-premptive nature. INCORRET. SJF is practically non-implementable because predicting burst time of a process before it's execution is not possible.

Hence, option D is correct.

2. (b)

Gantt Chart:

IDLE	D	A	C	E	B

0 1 3 6 10 15 32

Process	Arrival time	Burst time	Completion time	Turnaround Time	Waiting Time
A	2	3	6	4	1
B	4	17	32	28	11
C	2	4	10	8	4
D	1	2	3	2	0
E	7	5	15	8	3

Average Waiting time = (1 + 11+ 4 + 0 + 3)/ 5 = 3.8
Average Turnaround time = (4 + 28 + 8 + 2 + 8)/ 5 = 10

3. (a)

The function performed by the medium-term scheduler is called "Swapping".

- When the degree of multi-programming increases up to a certain point then CPU performance start decreasing due to page fault and context switching.
- Now, the medium-term scheduler starts swapping processes from "Ready state" and "waiting/block state" to "suspend Ready state" and "Suspend wait/block State" respectively to decrease the degree of multi-programming.
- "Suspend Ready State" and "Suspend wait/block State" are in secondary memory So, the Medium Term Scheduler selects the partially executed process from the secondary storage device and bring it back for execution.

4. (3.01)

Gantt Chart:

P0	P2	P3	P4	P5	P2	P1

0 3 4 6 7 9 12 17

Process	Arrival time	Burst time	Completion time	Turnaround Time	Waiting Time
P0	0	3	3	3	0
P1	2	5	17	15	10
P2	3	4	12	9	5
P3	4	2	6	2	0
P4	6	1	7	1	0
P5	6	2	9	3	1

Average waiting time = (0 + 10 + 5 + 0 + 0 + 1)/ 6
= 2.66

Throughput of the system = Number of processes/ Schedule Length.
= 6/(17 – 0)
= 6/ 17
= 0.35

So, Sum of Throughput and average waiting time
= 2.66 + 0.35 = 3.01

5. (c)

Gantt Chart:

	P_1		P_2		P_4		P_5		P_2		P_1		P_3		P_0	

0 1 2 3 4 5 6 7 9 10 13 14 19 20 26 27 35 36

Total Context Switches = 9

Schedule Length = 36

% of CPU overhead activity = 9/36 = 0.25 ≈ 25%

6. (a, c)

(a) Turnaround time includes waiting time. Correct; Turnaround time = CPU Burst time + IO burst time + **waiting time**

(b) SRTF can be used even when the CPU time required by each of the processes is not known apriori. Incorrect. SRTF cannot be implemented if CPU time required by each process is unknown, without knowing CPU burst time it is not possible to schedule process with shortest remaining time.

(c) Implementing preemptive scheduling needs hardware support. Correct. Preemptive scheduling may require timer for scheduling processes.

(d) The goal is to only maximize CPU utilization and minimize throughput. Incorrect. The goal of CPU scheduling is to maximize CPU utilization and maximize throughput as well.

7. (2.6)

Gantt Chart:

P1	P0	P2	P4	P3

0 2 5 9 11 17

Process	**Arrival time**	**Burst time**	**Completion time**	**Turnaround Time**	**Waiting Time**
P0	1	3	5	4	1
P1	0	2	2	2	0
P2	4	4	9	5	1
P3	3	6	17	14	8
P4	6	2	11	5	3

Average waiting time = (1+ 0 + 1+ 8 + 3)/ 5 = 2.6

8. (c)

Long term scheduler or Job scheduler selects the processes from the pool (or the secondary memory) and then maintains them in the primary memory's ready queue. The multiprogramming degree is mostly controlled by the long-term scheduler.