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Group MHA

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1) When a process creates a new process using the fork() operation, which of the following states is shared between the parent process and the child process? Stack, Heap, or Shared memory segments?

Answer:

Shared memory segments

2) Explain what the output will be at LINE A.

```
int value = 15;
int main() {
    pid_t pid;
    pid = fork();

    if (pid == 0) { /* child process */
        value += 10;
        return 0;
    } else if (pid > 0) { /* parent process */
        wait(NULL);
        printf("PARENT: value = %d",value); /* LINE A */
        return 0;
    }
}
```

Answer:

LINE A = 15

3) How many processes are created in the following code?

```
int main() {
    fork();
    fork();
    fork();
}
```

Answer:

8

4) See Section 4.1 of the “Operating Systems Concepts” book. Does the multithreaded web server described in that section exhibit task or data parallelism?

Answer:

Data parallelism

5) What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other?

Answer:

- The kernel does not know the **User-level threads** but the kernel know the User-level threads.
- The user thread is always belong to the process but the case is different with kernel thread.
- **User-threads** is better because the kernel threads its more expensive to maintain the kernel thread.

6) Describe the actions taken by a kernel to context-switch between kernellevel threads.

Answer:

- When switching out from a thread: Save CPU-registers value.
- When scheduling new thread: restoring CPU-registers value.

7) Explain the difference between preemptive and nonpreemptive scheduling.

Answer:

- preemptive: Preemptive scheduling makes the interruption of the process possible when the execution of the process is in the middle.
- Nonpreemptive: The intrubition is only possibly when the execution of the process is completed.

8) 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 nonpreemptive scheduling, and base all decisions on the information you have at the time the decision must be made.

<u>Process</u>	<u>Arrival Time</u>	<u>Burst Time</u>
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 FCFS scheduling algorithm?
- b. What is the average turnaround time for these processes with the SJF scheduling algorithm?
- c. 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

Answer:

- a) A the average turnaround time for **FCFS by use nonpreemptive scheduling** = $(8-0)+(12-0,4)+(13-12) / 3 = \mathbf{10,53}$
- b) The average turnaround time for these processes with the **SJF scheduling by use nonpreemptive scheduling** = $(8-0)+(9-1)+(13-0,4) / 3 = \mathbf{9,53}$
- c) The SJF algorithm the average turnaround time will be if the CPU is left idle for the first **1 unit** = $(1-1) + (6-0,4) + (15 -0) / 3 = \mathbf{6,86}$

9) Consider the following set of processes, with the length of the CPU burst time given in milliseconds.

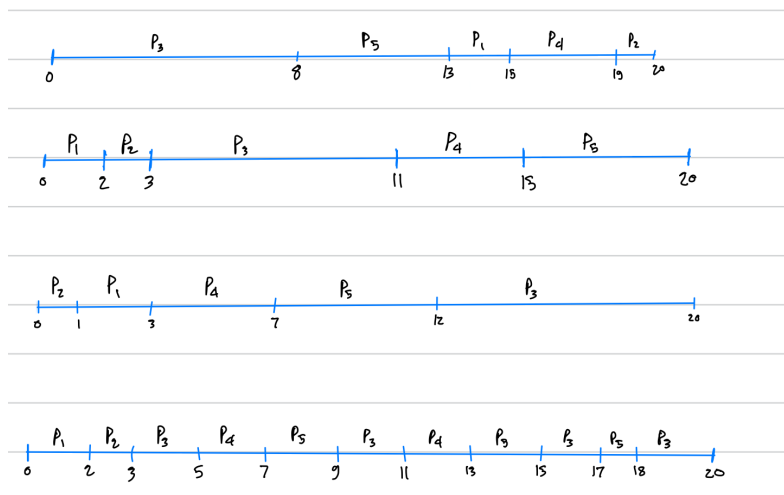
Process	Burst Time	Priority
P_1	2	2
P_2	1	1
P_3	8	4
P_4	4	2
P_5	5	3

The processes are assumed to have arrived in the order P_1, P_2, P_3, P_4, P_5 , all at time 0.

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

Answer:

a)



b) And c) The arrival time 0

a. RR

	turnaround time	Waiting time
P1	2	0
P2	3	2
P3	20	12
P4	13	9
P5	18	13

b. Priority

	turnaround time	Waiting time
P1	15	13
P2	20	19
P3	8	0
P4	19	15
P5	13	8

c. FCFS

	turnaround time	Waiting time
P1	2	0
P2	3	2
P3	11	3
P4	15	11
P5	20	15

d. SJF

	turnaround time	Waiting time
P1	3	1
P2	1	0
P3	20	12
P4	7	3
P5	12	7

d) The minimum average waiting time (over all processes)

a)RR = 7,2

b) Priority = 11

c)FCFS = 6,2

d) SJF 4,6

The answer is SJF**SOURCES:**

(ABRAHAM SILBERSCHATZ, 2018)