CS 341: Operating Systems, Quiz 1

Department of CSE, IIT Guwahati

Total marks- 20, Time- 50 minutes

1. Briefly explain why context switching between processes is inherently more costly than switching between threads of a process. (2 marks)

In a thread switch, the virtual memory space remains the same.

The process of switching in and out of the OS kernel along with the cost of switching out the registers is the large in a context switch.

2. Suppose a new process in a system arrives at an average of six processes per minute and each such process requires an average of 8 seconds of service time. Estimate the fraction of time the CPU is busy in a system with a single processor.

(3 marks)

Given that there are on an average 6 processes per minute.
So the arrival rate = 6 process/min.
i.e. every 10 seconds a new process arrives on an average.
Or we can say that every process stays for 10 seconds with the CPU
Service time = 8 sec.
Hence the fraction of time CPU is busy = service time / staying time
= 8 / 10
=0.8
So the CPU is busy for 80% of the time

3.Which of the following components of program state are shared across threads in a multithreaded process? (1 mark)

a) Register values b) Heap memory c) Global variables d) Stack memory

heap memory and global variables

4. Consider a variation of the Round-Robin scheduler, known as Regressive Round-Robin scheduler. This scheduler assigns each process a time quantum and a priority. The initial value of a time quantum is 50 milliseconds. However, every time a process has been allocated the CPU and uses its entire time quantum (does not block for I/O), 10 milliseconds is added to its time quantum, and its priority level is boosted. The time quantum for a process can be increased to a maximum of 100 milliseconds. When a process blocks before using its entire time quantum, its time quantum is reduced by 5 milliseconds, but its priority remains the same. What type of process (CPU-bound or I/O-bound) does the regressive round-robin scheduler favor? Explain.

(5 marks)

This scheduler would favor CPU-bound processes as they are rewarded with a longer time quantum as well as priority boost whenever they consume an entire time quantum. This scheduler does not penalize I/O-bound processes as they are likely to block for I/O before consuming their entire time quantum, but their priority remains the same.

5. Compare between the two models of interprocess communication. Which one of the two will you use for a multicore system and why? (2+2 marks)

Message passing for multicore system. Shared memory suffers from cache coherency issues.

6. Calculate the average turnaround time and average waiting time for the following jobs using SRTF scheduling algorithm. (5 marks)

Process ID	Arrival Time	Burst Time	Turn around time	Waiting time
1	0	8	20	12
2	1	4	9	5
3	2	2	2	0
4	3	1	2	1
5	4	3	9	6
6	5	2	2	0

Avg t.a time:

Avg. w.t: