COS214 Tutorial 3

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1. What two advantages do threads have over multiple processes? What major disadvantage do they have? Suggest one application that would benefit from the use of threads, and one that would not.

2. (a) What resources are used when a thread is created? How do they differ from those used when a process is created?
   (b) Describe the actions taken by a kernel to switch context:
      (i) Among threads.
      (ii) Among processes.

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

Process	Burst Time	Priority
P1	10	3
P2	1	1
P3	2	3
P4	1	4
P5	5	2

   Calculate the turnaround time for each process for each of the following scheduling algorithms:
   (a) Shortest-Job-First;
   (b) Nonpreemptive priority (smaller number means higher priority);
   (c) Round Robin with q=1.
   Assume P1 is at the head of the ready queue and P5 is at the tail.

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

Process	Burst Time	Arrival Time
P1	10	3
P2	1	1
P3	2	4
P4	1	3
P5	5	0

   Calculate the turnaround time for each process for each of the following scheduling algorithms:
   (a) Shortest-Job-First (SJF);
   (b) Shortest Remaining Time (SRT);
   (c) Round Robin (RR) with q=3.
   Assume each context switch takes 1 unit of time.

5. Suppose that a scheduling algorithm (at the level of short-term CPU scheduling) favors those processes that have used the least processor time in the recent past. Why will this algorithm favor I/O-bound programs and yet not permanently starve CPU-bound programs?

6. Consider a variant of the Round Robin (RR) scheduling algorithm where the entries in the ready queue are pointers to the Process Control Block's (PCB).
   (a) What would be the effect of putting two pointers to the same process in the ready queue?
   (b) What would be the major advantages and disadvantages of this scheme?
   (c) How would you modify the basic RR algorithm to achieve the same effect without the duplicate pointers?

7. Consider a system that collects and processes data from two sensors, A and B. The deadline for collecting data from sensor A must be met every 20 ms, and that for B every 50 ms. It takes 10 ms, including operating system overhead, to process each sample of data from A and 25 ms to process each sample of data from B.
   (a) List the execution profile of task A, listing the arrival time, execution time, and completion deadline. Repeat for the execution profile of task B.
   (b) Show how an earliest deadline scheduling policy with preemptive scheduling satisfies the real-time requirements for both tasks.