

Operating System (CS-33101)
MCA – 3rd Semester
Assignment 3

Q.1. Five batch jobs *A* through *E*, arrive at a computer center at almost the same time. They have estimated running times of 10, 6, 2, 4, and 8 minutes. Their (externally determined) priorities are 3, 5, 2, 1, and 4, respectively, with 5 being the highest priority. For each of the following scheduling algorithms, determine the mean process turnaround time. Ignore process switching overhead.

- (a) Round robin.
- (b) Priority scheduling.
- (c) First-come, first-served (run in order 10, 6, 2, 4, 8).
- (d) Shortest job first.

For (a), assume that the system is multiprogrammed, and that each job gets its fair share of the CPU. For (b) through (d) assume that only one job at a time runs, until it finishes. All jobs are completely CPU bound.

Q.2. Consider a system running ten I/O-bound tasks and one CPU-bound task. Assume that the I/O-bound tasks issue an I/O operation once for every millisecond of CPU computing and that each I/O operation takes 10 milliseconds to complete. Also assume that the context-switching overhead is 0.1 milliseconds and that all processes are long-running tasks. Describe the CPU utilization for a round-robin scheduler when:

- (i) The time quantum is 1 millisecond
- (ii) The time quantum is 10 milliseconds

Q.3. Consider the exponential average formula used to predict the length of the next CPU burst. What are the implications of assigning the following values to the parameters used by the SJF algorithm?

- (i) $\alpha = 0$ and $\tau_o = 100$ milliseconds
- (ii) $\alpha = 0.99$ and $\tau_o = 10$ milliseconds

Q.4. Consider a system implementing multilevel queue scheduling. What strategy can a computer user employ to maximize the amount of CPU time allocated to the user's process?

Q.5. Consider a load-balancing algorithm that ensures that each queue has approximately the same number of threads, independent of priority. How effectively would a priority-based scheduling algorithm handle this situation if one run queue had all high-priority threads and a second queue had all low-priority threads?

Q.6. Explain why interrupt and dispatch latency times must be bounded in a hard real-time system.

Q.7. Provide a specific circumstance that illustrates where rate-monotonic scheduling is inferior to earliest-deadline-first scheduling in meeting real-time process deadlines?