TUTORIAL THREE

CPU Scheduling

1. State whether each of the following statements are true or false. Justify your answers.

    (a)   A process scheduling discipline is preemptive if the CPU cannot be forcibly removed from a process.

    (b)   When a new process is admitted in the system, the short-term scheduler must execute in order to keep the CPU busy.

    (c)   For a process, response time = turnaround time – waiting time.

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

Process	CPU Burst Time	Priority	Arrival Time
P_1	10	3	0
P_2	1	1	0
P_3	2	3	2
P_4	1	4	2
P_5	5	2	4

    (a)   Draw four Gantt charts illustrating the execution of these processes using First-Come First-Served (FCFS), Shortest Job First (SJF), Preemptive Priority-based (smaller priority number implies higher priority), and Round-Robin (quantum=2) scheduling.

    (b)   What is the turnaround time of each process for each scheduling algorithm in part (a)?

    (c)   What is the waiting time of each process for each scheduling algorithm in part (a)?

    (d)   Which of the schedulers in part (a) results in the minimal average waiting time (over all processes)?

3. Measurements of a certain system have shown that the average process runs for time T before blocking on I/O. A process switch requires time S, which is effectively wasted (overhead). Define what is meant by CPU efficiency. For round robin scheduling with quantum Q, give a formula for the CPU efficiency for each of the following cases:

    (a) $Q \rightarrow \infty$
    (b) $Q > T$
    (c) $S < Q < T$
    (d) $Q = S$
    (e) $Q \rightarrow 0$