

1. [6 pt] Explain the difference between a mode switch and a context switch.
2. [6 pt] What purpose is served by long term scheduler and short term scheduler? What are the names for their corresponding queues?

3. [4 pt] Give two examples each of reusable and consumable resources.

4. [6 pt] How can you handle the circular wait condition to prevent deadlocks? Will your solution work with more than four resources?

5. [10 pt] Assume a system with four resource types, $C = \langle 10, 9, 7, 9 \rangle$ (this is the total number of resources in the system, and not what is currently available), and the maximum claim table shown below.

Process	R_0	R_1	R_2	R_3
p_0	0	0	4	2
p_1	4	1	3	3
p_2	1	2	1	3
p_3	0	4	2	3
p_4	0	2	5	5

The resource allocator is considering allocating resources according to the following table:

Process	R_0	R_1	R_2	R_3
p_0	0	0	2	0
p_1	4	1	0	2
p_2	1	2	0	2
p_3	0	2	1	1
p_4	0	2	4	4

Run the safety algorithm on this system to determine if this state is safe. If it is safe, give the sequence in which processes can be run. If it is unsafe, enumerate the processes that may get involved in a deadlock. Show your steps from the algorithm.

6. [15 pt] Assume you have the following jobs to execute with one processor:

Process	Burst time	Arrival time
p_0	3	0
p_1	6	1
p_2	1	4
p_3	5	7
p_4	10	8

Give the average wait time for this set of processes using the following algorithms.

(a) First in first out

(b) Shortest job next (non-preemptive)

(c) Shortest remaining time next (pre-emptive)

(d) Round robin, with a quantum of 3

(e) Round robin, with a quantum of 4 plus context switch time of 1