1. Explain the difference between preemptive and non-preemptive scheduling. Give one example of 4 single instance tasks, and one example of 3 periodic tasks, where the preemptive schedule and non-preemptive schedule are same, respectively. Please specify the scheduling algorithms you use in the examples. (10 points)

2. In real-time systems, one of the most dangerous phenomena caused by a transient overload is referred to the situation in which the arrival of a new task causes all previously guaranteed tasks to miss their deadlines. Assume all single instance tasks are independent with their own (a, d, c), in which a is the arrival time, d is the deadline and c is the computation time. Provide an example: in a previously feasible set of three single instance tasks, all tasks are missing the deadline caused by the arrival of a new task Jnew. You can use any scheduling algorithm. (10 points)

3. A system T contains three tasks, (8, 3) arriving at time 0, (9, 3) arriving at time 2 and (15, 3) arriving at time 1, is the system schedulable by the rate-monotonic algorithm? By the EDF algorithm? What about T = {(8, 2), (10, 2) and (12, 3)) with the same arriving times? Explain your answer. (10 points)
4. Give two different explanations of why the periodic tasks (2, 1), (4, 1), and (8, 2) are schedulable by the rate-monotonic algorithm. (10 points)

5. A system contains five periodic tasks. Their utilizations are \( U_1 = 0.8, U_2 = U_3 = U_4 = U_5 = 0.01 \). Are these tasks schedulable rate-monotonically? Be sure to explain your answer. (10 points)
6. Prove that EDF is optimal for independent tasks on uniprocessors. What about non-independent tasks? Please explain your answer by a proof or showing a counter example. (15 points)

7. Consider a three-task system where each preemption has an overload of x. Given C1, C2, C3, P1, P2 P3, please explain how to obtain the maximum value of x for which the task set is RM-schedulable. (10 points)

8. Can you construct a task set that can be scheduled by the RM, EDF and LLF algorithms? Can you construct a task set that can be scheduled by RM and not by EDF?
Can you construct a task set that can be scheduled by EDF and not by RM? Can you construct a task set that can be scheduled by EDF and not by LLF? Please show an example for any YES answer or give the explanation for any NO answer. (15 points)

9. Determine whether there is a feasible schedule for the following set of periodic processes. If yes, show the schedule and the steps used to derive it. (10 points)

T1: c11 = 3, c12 = 2, c13 = 3, d1 = 17, p1 = 18
T2: c21 = 1, c22 = 2, d2 = p2 = 6
T3: c3 = 1, d3 = p3 = 18

T1 must rendezvous with T2 after the first, second, and third scheduling blocks.
T2 must rendezvous with T1 after the first scheduling block.