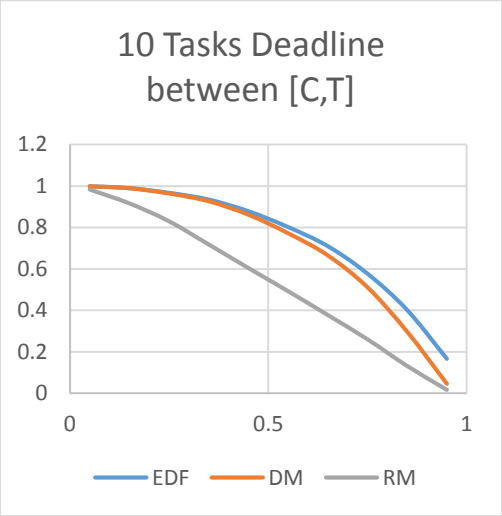
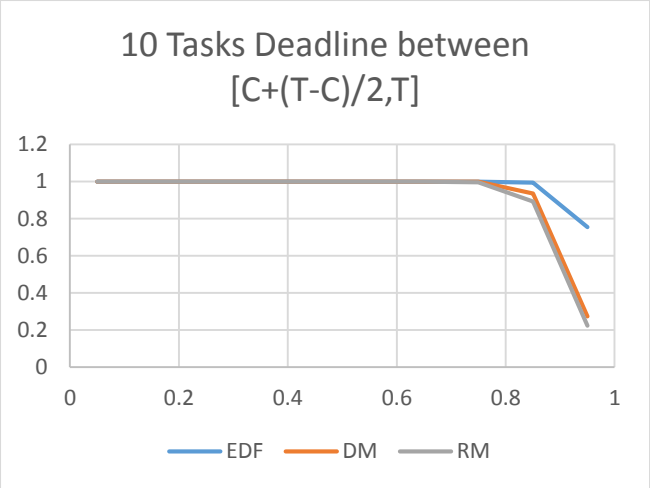
RUSHANG V KARIA

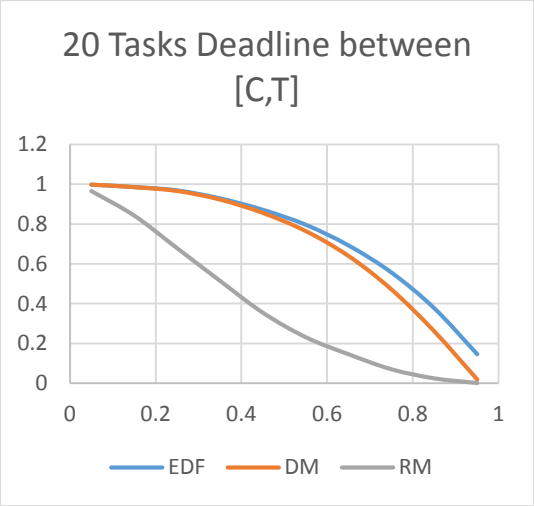
REAL TIME SYSTEMS

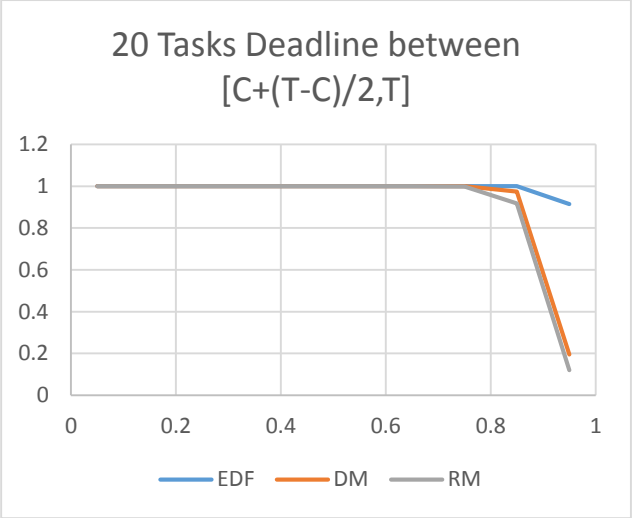
ASSIGNMENT 2

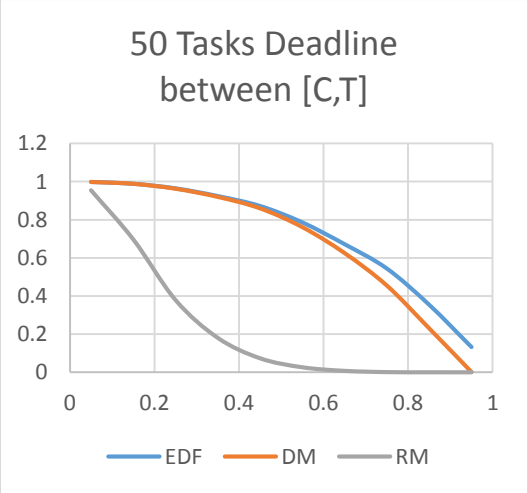
REPORT { Details are on the next page } { you can increase }

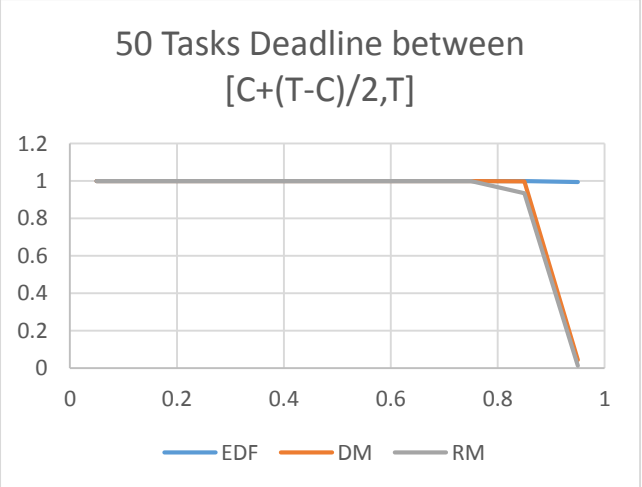












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ANALYSIS

On observing the graphs one can make several key points

1. EDF outperforms RM and DM algorithms, DM outperforms RM
2. As we push the deadlines closer to the periods the success rate increases tremendously.
3. As the no of tasks increases and deadlines are closer to Execution times, even at the same level of utilization, the decay rate is much greater than when there are few tasks for RM

EXPLANATIONS FOR OBSERVATIONS

1. EDF is a dynamic priority algorithm, therefore it can adjust the priorities such that for any task the level-I busy period will be small. For RM, DM the level-I busy period is fixed and cannot be changed. Thus these algorithms fail to produce optimal busy period. Thus EDF will always outperform RM/DM.
    a. DM outperforms RM since DM tries to optimize the busy periods, in that the priorities are fixed by a pseudo-taskset whose priorities are determined by the minimum of the period and deadline. By doing this it assumes more arrivals, ie. Increases rate and decreases its busy period. This reordering helps the algorithm optimize. Thus it will closely resemble EDF.
    b. DM and EDF have a little difference of fixed vs dynamic priorities. Therefore they seem to have the same performance except where the loads become high and dynamic priority matters.
2. Since we allow the deadlines to be closer to periods, we slack the density of the tasks. That means in our pseudo-taskset the denominator becomes larger and the density becomes lower, thus we can increase the number of tasks in our sigma expression. Since our no of tasks were fixed, we in effect slacked off the requirement.
3. Again, as the no of tasks increase, we add more terms to our expression for density, the density increases. But this does not necessarily mean that the tasks should be unschedulable at a greater percentage.
    a. What is happening behind the scenes is that, there are now more busy periods to consider and there are now several tasks with shorter deadlines but large periods that are being demoted as lower priority. This increases the length of their busy period and therefore increases their worst case execution time. At a sufficient load atleast 1 task is certain to miss its deadline.
    b. Consider n tasks, n-1 tasks have a high priority but lesser deadline than nth task. They all contribute to the busy period of the nth task. So now the question is is sum(WCET(n-1)) < Deadline(nth task). Since the deadlines are closer to WCET for all tasks, the question now becomes is sum(WCET(n-1))<WCET(n).
    c. Since we have utilizations uniformly distributed, we can have the Expectations follow the same distribution and if we do the math, the probability tends to zero for the nth task