Project 2: Real Time Scheduling

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Algorithms

In this project, we will study the following real time scheduling algorithms:

- Rate Monotonic (**RM**)
- Earliest Deadline First (**EDF**)
- Least Laxity First (**LLF**)

Rate Monotonic (**RM**)

General Description:

Rate monotonic is a priority assignment algorithm used in real-time operating systems with a static-priority scheduling class. The static priorities are assigned according to the cycle duration of the job, so a shorter cycle duration results in a higher job priority.

Rate Monotonic (**RM**)

Schedulability Test:

$$\prod_{i=0}^{n} \left(\frac{E_i}{P_i} + 1 \right) \leq 2 \tag{1}$$

- E_i: execution time of the task i.
- P_i: period of the task i.

Earliest Deadline First (**EDF**)

General Description:

Earliest Deadline First is a dynamic priority scheduling algorithm used in real-time operating systems to place processes in a priority queue. Whenever a scheduling event occurs the queue will be searched for the process closest to its deadline. This process is the next to be scheduled for execution.

Earliest Deadline First (**EDF**)

Schedulability Test:

$$\sum_{i=0}^{n} \left(\frac{E_i}{P_i} \right) \leq 1 \tag{2}$$

- E_i: execution time of the task i.
- P_i: period of the task i.

Least Laxity First (**LLF**)

General Description:

Least Laxity First is a job level dynamic priority scheduling algorithm. It means that every instant is a scheduling event because laxity of each task changes on every instant of time. A task which has least laxity at an instant, it will have higher priority than others at this instant. Laxity is mathematically it is described as

$$L_i = D_i - (t_i + C_i^r) \tag{3}$$

- D_i: next deadline of the task at t_i.
- t_i: current execution time.
- C_i^r: remaining computer time of the task at t_i.

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Least Laxity First (**LLF**)

Schedulability Test:

$$\sum_{i=0}^{n} \left(\frac{E_i}{P_i} \right) \leq 1 \tag{4}$$

- E_i: execution time of the task i.
- P_i: period of the task i.

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Schedulability Tests

Task ID	Execution Time	Period
1	10	180
2	20	180
3	30	180
4	40	180
5	50	180
6	60	180
7	70	180

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- RM

$$\prod_{i=0}^{n}\left(\frac{E_i}{P_i}+1\right) \leq 2 \rightarrow 3,957283 \leq 2 \tag{5}$$

  - Failed
- EDF

$$\sum_{i=0}^{n}\left(\frac{E_i}{P_i}\right) \leq 1 \rightarrow 1,555556 \leq 1 \tag{6}$$

  - Failed
- LLF

$$\sum_{i=0}^{n}\left(\frac{E_i}{P_i}\right) \leq 1 \rightarrow 1,555556 \leq 1 \tag{7}$$

  - Failed

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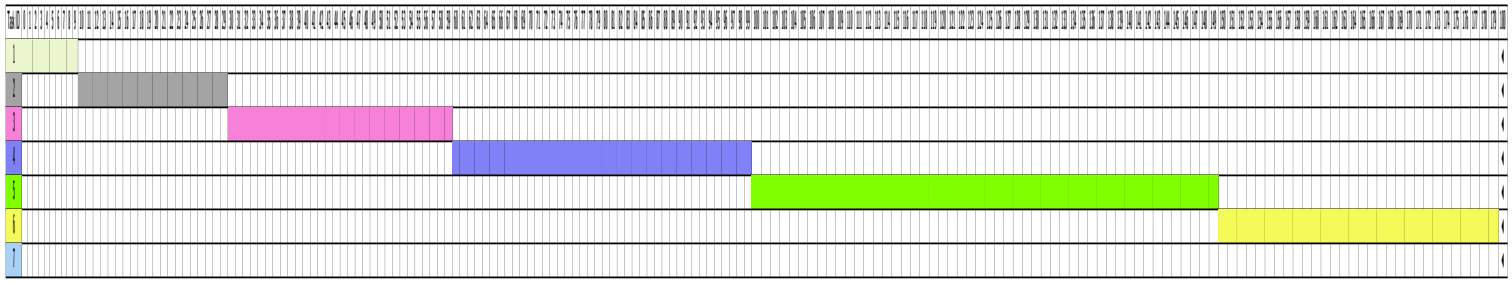
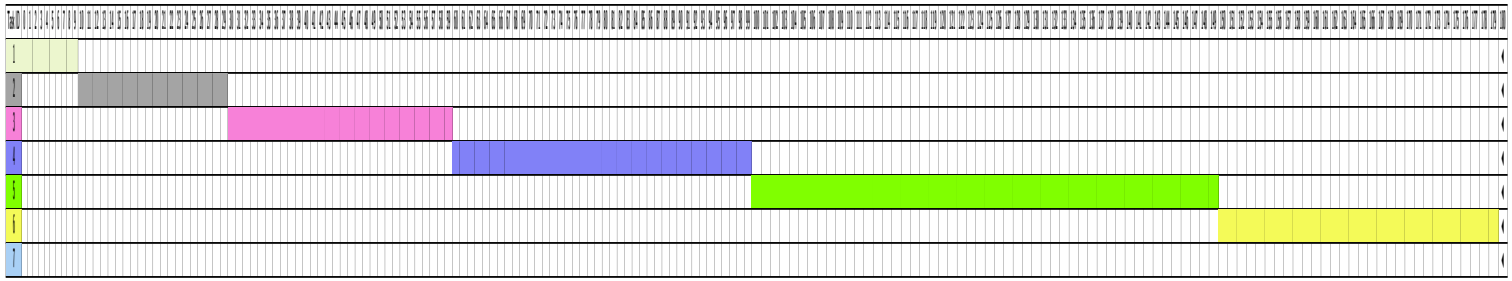
Execution

- RM



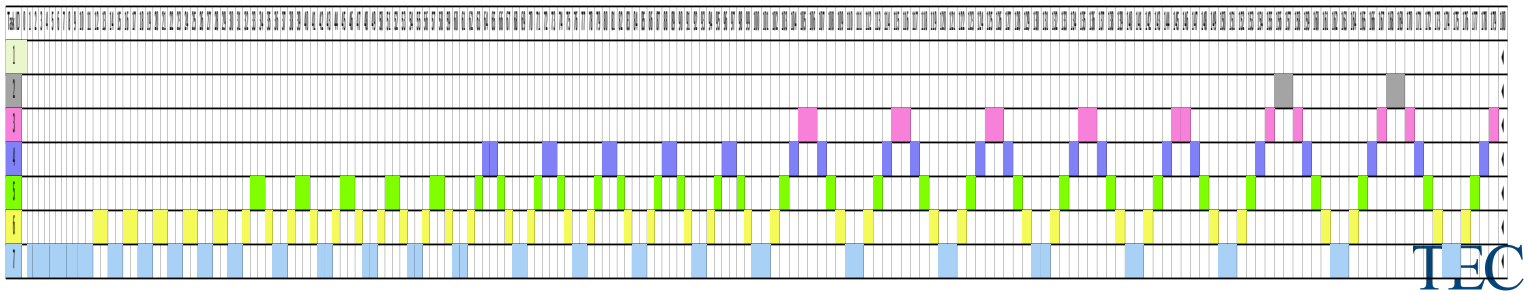
  - Error: Deadline missed at 180

- EDF



  - Error: Deadline missed at 180

- LLF



  - Error: Deadline missed at 180