Earlist Deadline First
Project

Calculating CPU Utilization for the following Tasks to Prove Schedulablility:

$Button\_1(P: 50, D: 50, E: 2.5)$

$Button\_2(P: 50, D: 50, E: 2.5)$

$Period\_Transmission(P: 100, D: 100, E: 5)$

$Uart\_Receive(P: 20, D: 20, E: 2)$

$$U = \sum_{i=1}^{n} \frac{C_i}{P_i} \leq n\left(2^{\frac{1}{n}} - 1\right) \qquad U = Total\ Utilization,$$

$$n = number\ of\ Tasks, C = Execution\ time,$$
$$P = hyper\ Period$$

$$U = \left(\frac{2 * 2.5}{100}\right) + \left(\frac{2 * 2.5}{100}\right) + \left(\frac{5}{100}\right) + \left(\frac{5 * 2}{100}\right) = 0.25$$

$$URM = 4 * \left(2^{\frac{1}{4}} - 1\right) = 0.76 \quad URM = Rate\ Monotonic\ Utilization$$

$$\because U \leq URM$$

$$\therefore The\ System\ is\ Schedulable\ for\ Fixed\ Priority\ Task\ with\ Only\ 4\ Tasks$$

Now to add 2 more Load Tasks and re-calculate the CPU utilization and Rate monotonic utilization:

$Load\_1(P: 10, D: 10, E: 5)$

$Load\_2(P: 100, D: 100, E: 12)$

$$U = \left(\frac{2 * 2.5}{100}\right) + \left(\frac{2 * 2.5}{100}\right) + \left(\frac{5}{100}\right) + \left(\frac{5 * 2}{100}\right) + \left(\frac{10 * 5}{100}\right) + \left(\frac{12}{100}\right) = 0.87$$

$$URM = 6 * \left(2^{\frac{1}{6}} - 1\right) = 0.735$$

$$\because U > URM$$

$$\therefore The\ system\ is\ not\ going\ to\ be\ Schedulable$$

Figure (1) shows the Schedulable System, while Figure (2) will show the System is going to be not Schedulable when it comes to Fixed Priority.
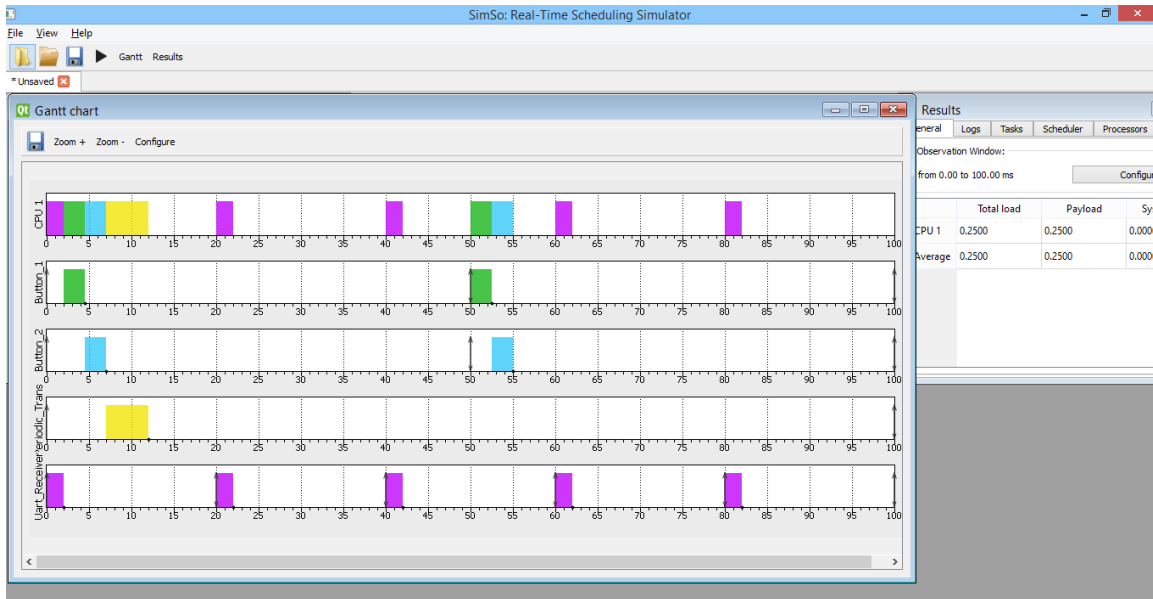

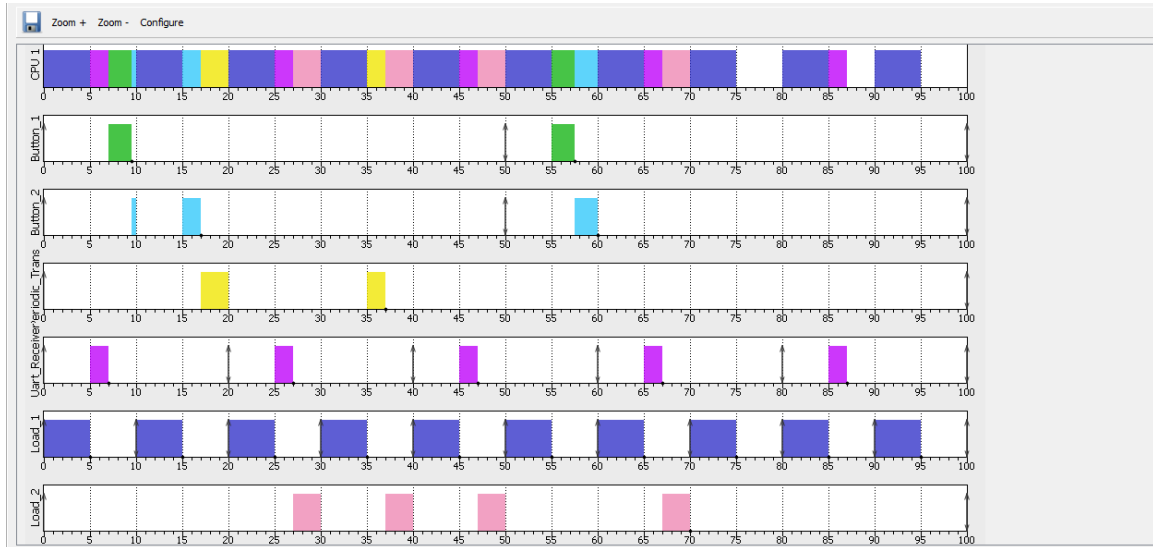*Figure (1) Rate Monotic Schedulablility for the 4 Main Tasks*

Figure (2) Rate-monotonic with all 6 Tasks added to CPU Load

The Following Figure is showing the Behavior of the system based on Events as follows:
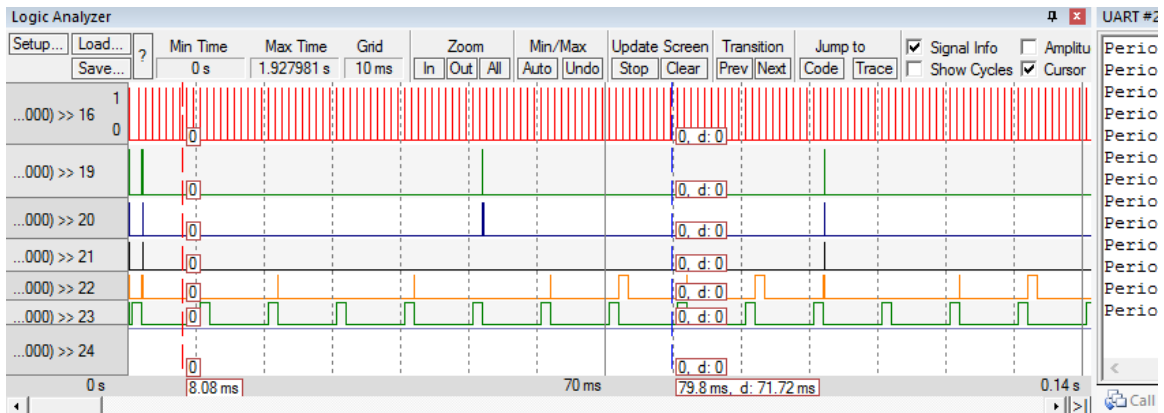
Using Logic Analyzer:

Figure (3) Logic Analyzer showing the behavior of the System with both load Functions sequentially