1-Task Parameters:

Task name	Task periodicity deadline	Task execution time (Calculated)
Button_1_Monitor	50	2.2 us
Button_2_Monitor	50	2.2 us
Periodic_Transmitter	100	40.07 ms
Uart_Receiver	20	54 us
Load_1_Simulation	10	5 ms
Load_2_Simulation	100	12 ms

2-Hyperperiod:

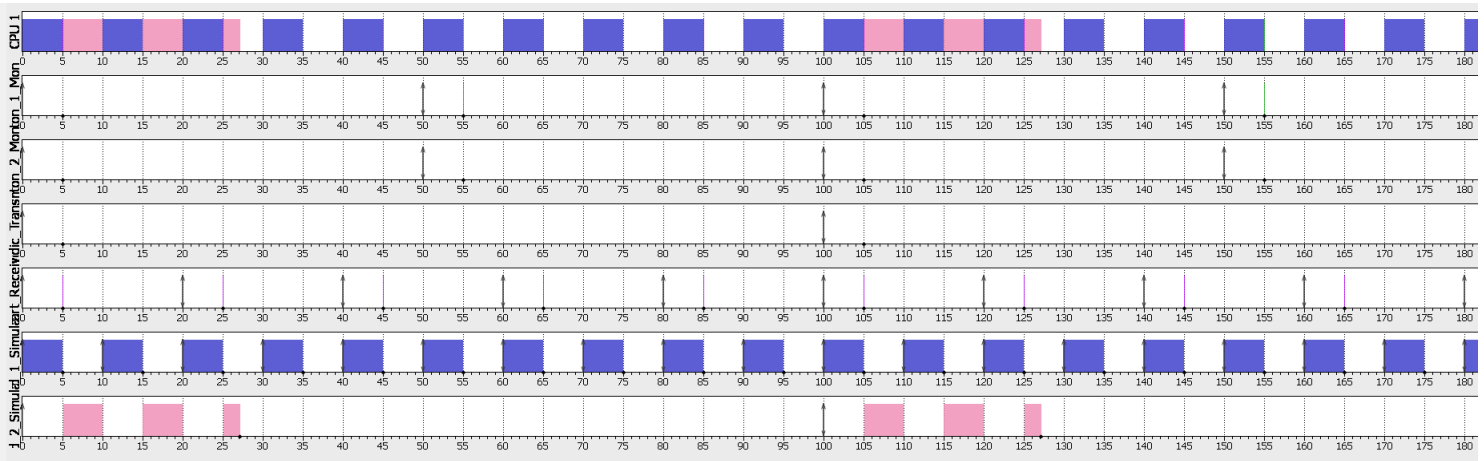
Equals the least common factor between the task's periodicities = 100 ms

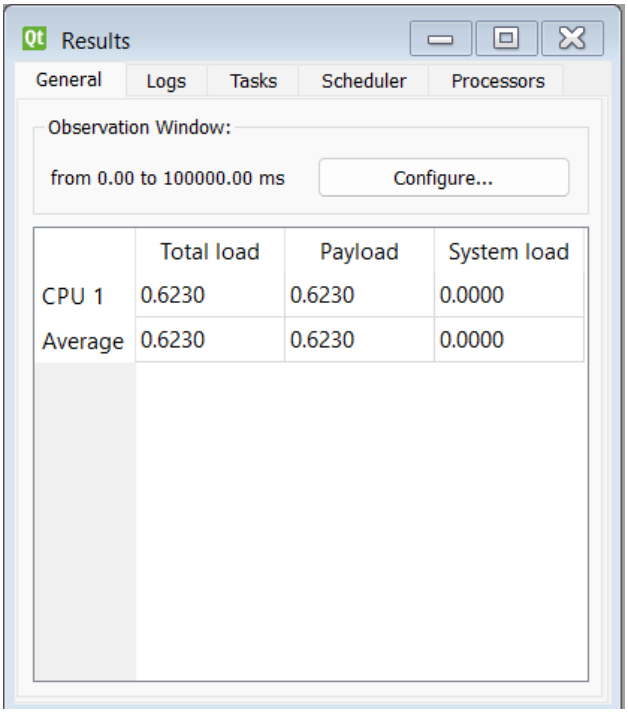
3-Offline Simulation (SIMSO):

Model data

General | Scheduler | Processors | Tasks

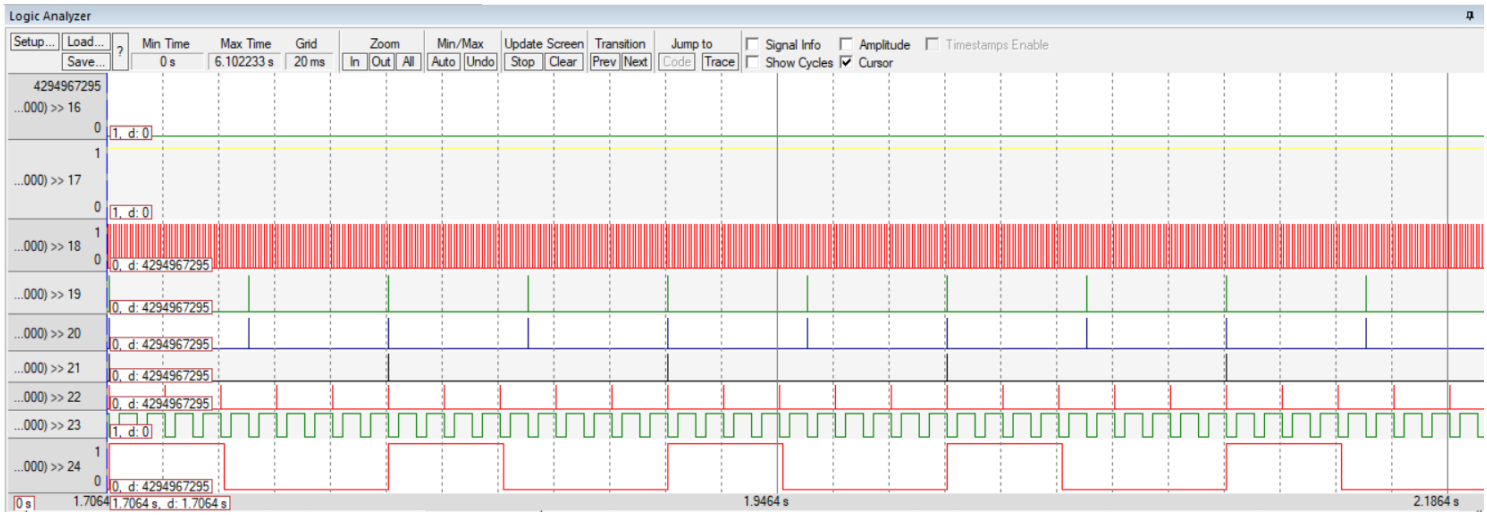
id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by
1	Button_1_Monitor	Periodic	No	0	50	-	50	0.0022	
2	Button_2_Monitor	Periodic	No	0	50	-	50	0.0022	
3	Periodic_Transmitter	Periodic	No	0	100	-	100	40.07	
4	Uart_Receiver	Periodic	No	0	20	-	20	54	
5	Load_1_Simulation	Periodic	No	0	10	-	10	5	
6	Load_2_Simulation	Periodic	No	0	100	-	100	12	





The system is schedulable with CPU load = 62.3%

4-Run-time simulation



5-Scheduling analysis:

A-Rate Monotonic

$$U \leq n(2^{\frac{1}{n}} - 1)$$

Utilization= (total execution time per hyperperiod/hyperperiod) *100
= (62.3/100) *100= 62.3%
Number of tasks =6

$$\therefore U_{rm} = 6 * (2^{\frac{1}{6}} - 1) = 0.7347$$

$$\therefore U < U_{rm}$$

The system is schedulable

B- Time demand analysis

$$W_i = e_i + \sum_{k=1}^{i-1} \left\lceil \frac{t}{p_k} \right\rceil e_k$$

Analysis has been made on the system critical points which are at the hyperperiods

1- Button_1_Monitor

$W_1(50) = 0.0022 + 0.0022 + 0.02415 + (6 * 5) + (3 * 0.054) = 30.19055 < 50$

Task 1 is schedulable

2- Button_2_Monitor

$W_2(50) = (2*0.0022) + 0.0022 + 0.02415 + (6 * 5) + (3 * 0.054) = 30.19275 < 50$

Task 2 is schedulable

3- Periodic_Transmitter

$W_3(100) = (2*0.0022) + (2*0.0022) + 0.02415 + (10 * 5) + (5 * 0.054) + 12 = 62.30295 < 100$

Task 3 is schedulable

4- Uart_Receiver

$W_4(20) = 0.\ 054 + 5 = 5.054 < 20$

Task 4 is schedulable

5- Load_1_Simulation

$W_5(10) = 5 < 10$

Task 5 is schedulable

6- Load_2_Simulation

$W_6(100) = (2*0.0022) + (2*0.0022) + 0.02415 + (10 * 5) + (5 * 0.054) + 12 = 62.30295 < 100$

Task 3 is schedulable