Project 2

Implementing EDF Scheduler

Egypt Future Work Digital Scholarship (FWD)

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Connect Sessions: Monday 8:00-10:00 PM

The implemented tasks are the following (according to the description)

- **Calculate the system hyper period:**

  It is the largest in all tasks which is 100 milliseconds

- **Calculate the CPU load:**

  - **Execution Time Of Each Task / Hyper Period**

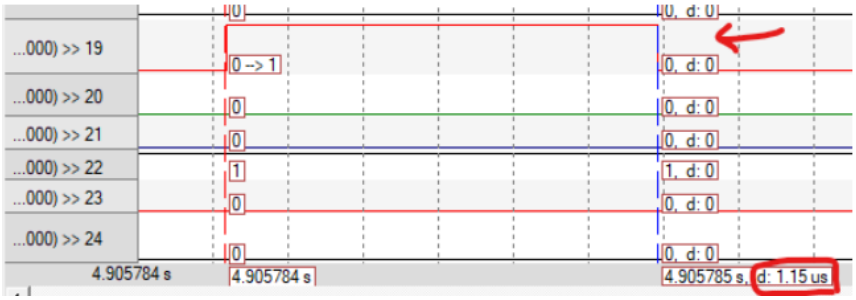
Tasks	Button_1	Button_2	Transmitting_ Uart	Receiving_ Uart	First_ load	Second_ load
Periodicity	50 ms	50 ms	100 ms	20 ms	10 ms	100 ms
Execution Time	1.15 us	1.1 us	9.13 us	63.067 us	5 ms	12 ms
Load 1	1.15us / 50ms	1.1us /50ms	9.13us /100ms	63.067us /20ms	5ms /10ms	12ms /100ms
L1	23us	22us	91.3us	31.5us	0.5s	0.12s

  - **Then add them**

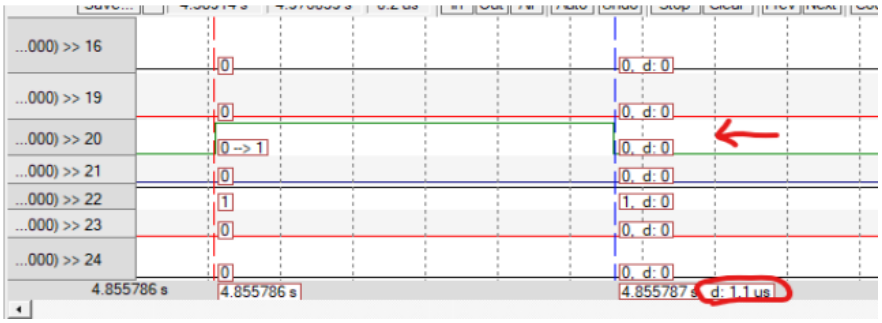
CPU_Load = (23us+22us+91.3us+31.5us+0.5+0.12) = 0.6232863 *100 = 62.3%

- **Tasks Screenshots**

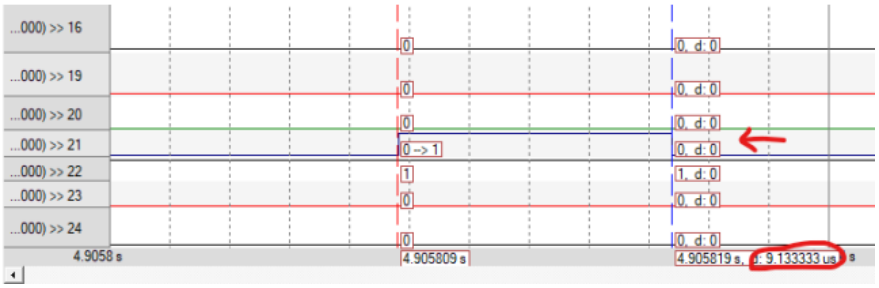
Task_1:



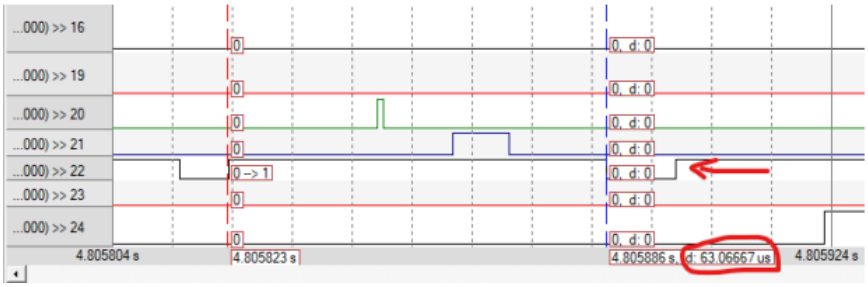
Task_2:



Task_3:



Task_4:



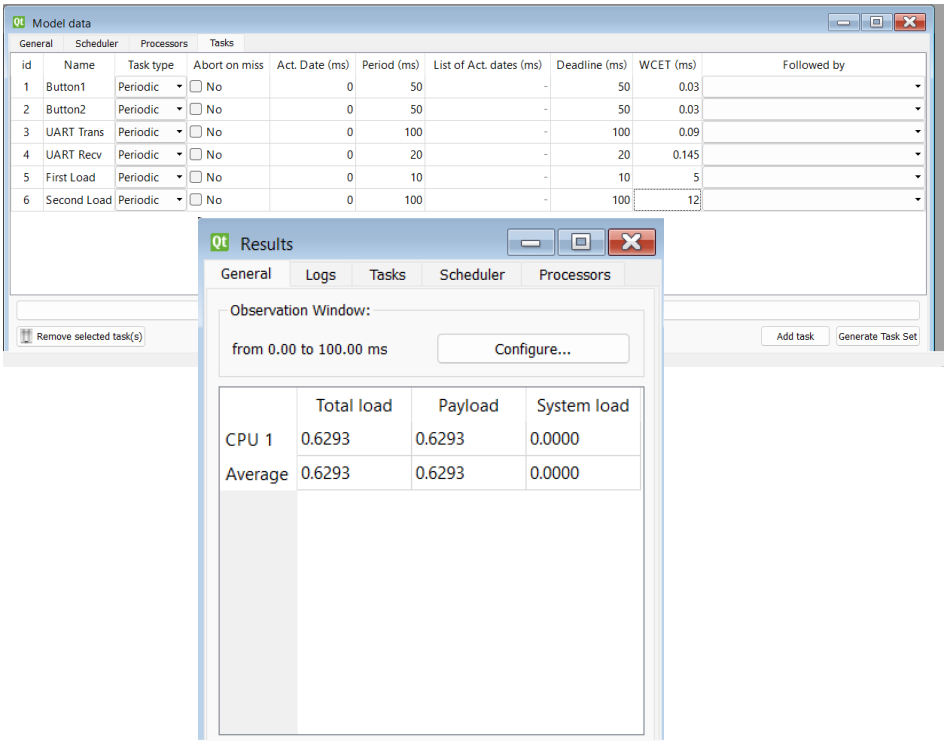
- **Check system schedulable:**

1. Using URM:

Total utilization U = 0.62328 ~ 0.6233

Which is less than n $\left(2^{\frac{1}{n}} - 1\right) = 6\left(2^{\frac{1}{6}} - 1\right) = 0.73477$

Then, the system is schedulable



2. Using Time Demand:

T_1 (Button1 Monitor):

$$W(50) = 1.15u + \left(\frac{50}{10}\right) * 5 + \left(\frac{50}{20}\right) * 63ms = 25.2$$

25.2 is less than 50 (deadline is not violated)

T_2 (Button2 Monitor):

$$W(50) = 1.1ms + \left(\frac{50}{10}\right) * 5 + \left(\frac{50}{50}\right) * 1.5ms + \left(\frac{50}{20}\right) * 63ms = 25.2$$

25.2 is less than 50 (deadline is not violated)

T_3 (UART transmit):

$$W(100) = 9.13\text{ms} + \left(\frac{100}{50}\right) * 5 + \left(\frac{100}{50}\right) * 1.5\text{ms} + \left(\frac{100}{20}\right) * 63\text{ms} + \left(\frac{100}{10}\right) * 5$$

$$= 50.33$$

50.33 is less than 100 (deadline is not violated)

T_4 (UART receive):

$$W = 63\text{ms} + \left(\frac{20}{10}\right) * 5 = 10.1$$

10.1 is less than 20 (deadline is not violated)

T_5 (Load_1):

$$W = 5$$

5 is less than 10 (deadline is not violated)

T_6 (Load_2):

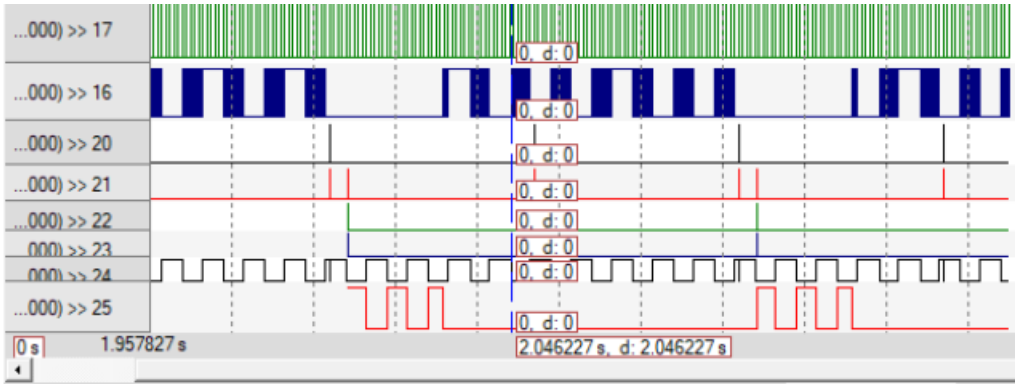
$$W(100) = 12 + \left(\frac{100}{50}\right) * 30 + \left(\frac{100}{50}\right) * 1.5\text{ms} + \left(\frac{100}{20}\right) * 63\text{ms} + \left(\frac{100}{10}\right) * 5 + 9.13\text{ms} = 62.33$$

62.33 is less than 100 (deadline is not violated)

<u>Since none of the task violated the deadline, the overall system is schedulable</u>.

- **Using simulators to calculate the real execution time:**
  1. Using Sismo simulation tool:

  2. Using Keil simulation tool (using rate monotonic)



The pins used are :

pin 19 : button1_monitor

pin 20 : button2_monitor

pin 21 : Periodic_Transmitter

pin 22 : UART_Receiver