Assignment 4

Task number	periodicity	Execution time	deadline
t1	**5**	**2.5**	**5**
t2	**15**	**4.5**	**15**
t3	**20**	**3.5**	**20**

First method: Rate-monotonic utilization bound

U = $\Sigma ci/pi$

U = 2.5/5 + 4.5/15 + 3.5/20 = 0.975

URM = n(2^(1/n) - 1)

URM = 3(2^(⅓)-1) = 0.77976

U > URM

THEN SYSTEM GUARANTEED NOT SCHEDULABLE

Second method: time-demand analysis

Wi(t) = Ei + $\sum(t/Pk) * Ek$

1- time demand for Task 1

w1(1) = 2.5 + 0 = 2.5

w1(2) = 2.5 + 0 = 2.5

w1(3) = 2.5 + 0 = 2.5

w1(4) = 2.5 + 0 = 2.5

w1(5) = 2.5 + 0 = 2.5 < 5

Then task 1 is schedulable

2- time demand for task 2

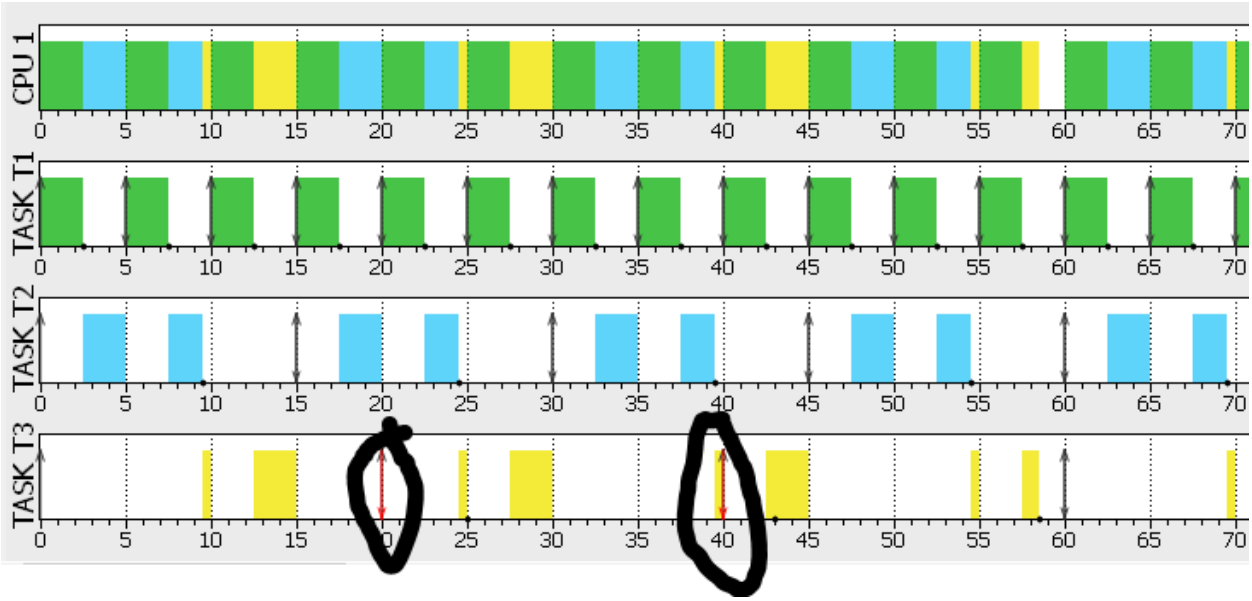
W2(1) = 4.5 + 1/5 * 2.5 = 7
W2(2) = 4.5 + 2/5* 2.5 = 7
W2(3) = 4.5 + 3/5* 2.5 = 7
W2(4) = 4.5 + 4/5* 2.5 = 7
W2(5) = 4.5 + 5/5* 2.5 = 7
W2(6) = 4.5 + 6/5* 2.5 = 9.5
W2(7) = 4.5 + 7/5* 2.5 = 9.5
W2(8) = 4.5 + 8/5* 2.5 = 9.5
W2(9) = 4.5 + 9/5* 2.5 = 9.5
W2(10) = 4.5 + 10/5* 2.5 = 9.5
W2(11) = 4.5 + 11/5* 2.5 = 12
W2(12) = 4.5 + 12/5* 2.5 = 12
W2(13) = 4.5 + 13/5* 2.5 = 12
W2(14) = 4.5 + 14/5* 2.5 = 12
W2(15) = 4.5 + 15/5* 2.5 = 12

3- time demand for task 3

W3(1) = 3.5 + 1/5 * 2.5 + 1/15 * 4.5 = 10.5
W3(2) = 3.5 + 2/5* 2.5 + 2/15 * 4.5 = 10.5
W3(3) = 3.5 + 3/5* 2.5 + 3/15 * 4.5 = 10.5
W3(4) = 3.5 + 4/5* 2.5 + 4/15 * 4.5 = 10.5
W3(5) = 3.5 + 5/5* 2.5 + 5/15 * 4.5 = 10.5
W3(6) = 3.5 + 6/5* 2.5 + 6/15 * 4.5 = 13
W3(7) = 3.5 + 7/5* 2.5 + 7/15 * 4.5 = 13
W3(8) = 3.5 + 8/5* 2.5 + 8/15 * 4.5 = 13
W3(9) = 3.5 + 9/5* 2.5 + 9/15 * 4.5 = 13
W3(10) = 3.5 + 10/5* 2.5 + 10/15 * 4.5 = 13
W3(11) = 3.5 + 11/5* 2.5 + 11/15 * 4.5 = 15.5
W3(12) = 3.5 + 12/5* 2.5 + 12/15 * 4.5 = 15.5
W3(13) = 3.5 + 13/5* 2.5 + 13/15 * 4.5 = 15.5
W3(14) = 3.5 + 14/5* 2.5 + 14/15 * 4.5 = 15.5
W3(15) = 3.5 + 15/5* 2.5 + 15/15 * 4.5 = 15.5

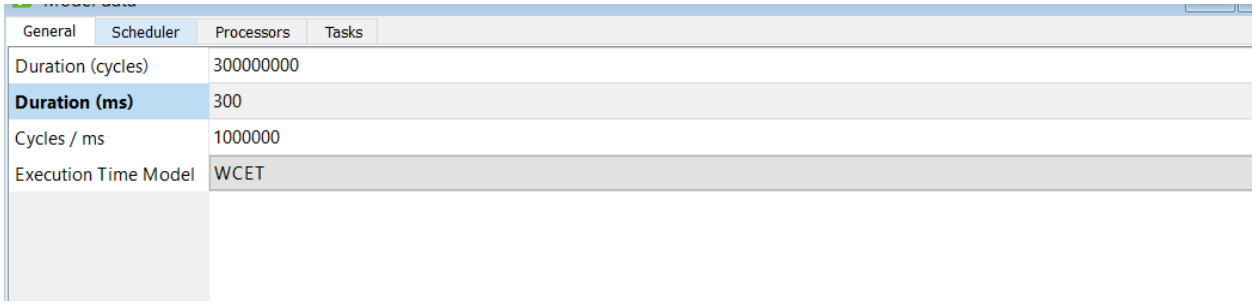
W3(16) = 3.5 + 16/5* 2.5 + 16/15 * 4.5 = 22.5
W3(17) = 3.5 + 17/5* 2.5 + 17/15 * 4.5 = 22.5
W3(18) = 3.5 + 18/5* 2.5 + 18/15 * 4.5 = 22.5
W3(19) = 3.5 + 19/5* 2.5 + 19/15 * 4.5 = 22.5
W3(20) = 3.5 + 20/5* 2.5 + 20/15 * 4.5 = 22.5 > 20
Then task 3 is not schedulable

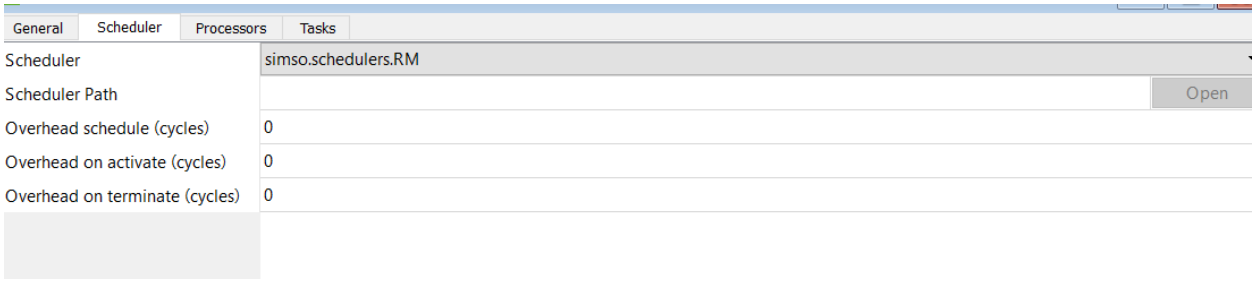
Simso simulation



	Total load	Payload	System load
CPU 1	0.9750	0.9750	0.0000
Average	0.9750	0.9750	0.0000

id	Name	Task type	Abort on miss	Act. Date (ms)	Period (ms)	List of Act. dates (ms)	Deadline (ms)	WCET (ms)	Followed by
1	TASK T1	Periodic	No	0	5	-	5	2.5	
2	TASK T2	Periodic	No	0	15	-	15	4.5	
3	TASK T3	Periodic	No	0	20	-	20	3.5	





Comments:

From time demand calculations and simso simulation the system is not schedulable because task 3 is not schedulable