Assignment 3

**Theory assignment**

The following part of assignment is a purely theoretical task that requires no additional tools. The task is to find the largest possible frame size for the cyclic structured scheduler by following requirements 1,2 and 3 for finding the largest frame size. The following three task sets should be used:

1. T1(15, 1, 14) T2(20, 2, 26) T3(22, 3)
2. T1(4, 1) T2(5, 2, 7) T3(20, 5)
3. T1(5, 0.1) T2(7, 1) T3(12, 6) T4(45, 9)

-Provide a written report which should contain:

* Calculations for each step for finding the frame size for each task set
* Resulting frame size for each task set

1. H = LCM(15, 20, 22) = 660

f >= ei, f >= 3

f|H f = 2, 3, 4, 5, 6, 10, 11…

2f – gcd(pi,f) <= Di

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Task 1** | **Task 2** | **Task 3** |
| **period** | 15 | 20 | 22 |
| **execution** | 1 | 2 | 3 |
| **deadline** | 14 | 20 | 22 |
| **f** | Compare to deadline | | |
| 11 | 21 | 21 | 11 |
| 10 | 15 | 10 | 18 |
| 6 | 9 | 10 | 10 |
| 5 | 5 | 5 | 9 |
| 4 | 7 | 4 | 6 |
| 3 | 3 | 5 | 5 |
| 2 | 3 | 2 | 2 |

**Frame Size = 6**

1. H = LCM (4, 5, 20) = 20

f>= ei f >= 5

f|H f = 2, 4, 5, 10, 20

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Task 1** | **Task 2** | **Task 3** |
| **period** | 4 | 5 | 20 |
| **execution** | 1 | 2 | 5 |
| **deadline** | 4 | 5 | 20 |
| **f** | Compare to deadline | | |
| 20 | 36 | 35 | 20 |
| 10 | 18 | 15 | 10 |
| 5 | 9 | 5 | 5 |
| 4 | 4 | 7 | 4 |
| 2 | 2 | 3 | 2 |

**No frame works, could choose Frame Size = 2, but it is not larger than the execution task3, with f >= 5. Task3 should be divided into 3 parts of execution time 2ms. Notice that deadline on task2 is 5 and not 7 because of the period.**

1. H = LCM (5, 7, 12, 45) = 1260

f>= ei f >= 9

f|H f = 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14,15,18,20,21,28,30,36,35,42,45,

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Task 1** | **Task 2** | **Task 3** | **Task 4** |
| **period** | 5 | 7 | 12 | 45 |
| **execution** | 0.1 | 1 | 6 | 9 |
| **deadline** | 5 | 7 | 12 | 45 |
| **f** | Compare to deadline | | | |
| 28 | 55 | 49 | 52 | 55 |
| 21 | 41 | 35 | 39 | 39 |
| 20 | 35 | 39 | 36 | 35 |
| 18 | 35 | 35 | 30 | 27 |
| 15 | 25 | 29 | 27 | 15 |
| 14 | 27 | 21 | 26 | 27 |
| 12 | 23 | 23 | 12 | 21 |
| 10 | 15 | 19 | 18 | 15 |
| 9 | 17 | 17 | 15 | 9 |
| 7 | 13 | 7 | 13 | 13 |
| 6 | 11 | 11 | 6 | 9 |
| 5 | 5 | 9 | 9 | 5 |
| 4 | 7 | 7 | 4 | 7 |
| 3 | 5 | 5 | 3 | 3 |
| 2 | 3 | 3 | 2 | 3 |
| 1 | 1 | 1 | 1 | 1 |

**No frame works, could choose 3 but it is no larger of equal to 8. Task3 and Task4 should be divided into equal 3ms parts for it to work.**

**Simulation assignment**

Input the tasks T1(2, 0.5), T2(3, 1.2), T3(6, 0.5) and the RM scheduler into the SimSo simulator

Chart

Description automatically generated

* What is the utilization factor of the system and what is the value for Urm(3)

Utilization = 0.5/2 + 1.2/3 + 0.5/6 = 0.733

URM(3) = 0.7798

Since Utilization < URM, it is considered feasible

* What is the minimum/maximum/average response time of all tasks?

Table

Description automatically generated

* Is any task missing the deadline? Which task? Where?

No task is missing the deadline

* If a deadline is missed, could it be avoided by changing the scheduler?

It is not missing, it’s not necessary

Input the tasks T1(2, 0.5, 1.9) T2(5, 2) T3(1, 0.1, 0.5) T4(10, 5, 20) and the EDF scheduler into the SimSo simulator

A picture containing application

Description automatically generated

* What is the utilization factor of the system and what is the value for Urm(4)
* Utilization = 1.25

URM(4) = 0.7568

It is not feasible, Utilization is greater than 1

* What is the minimum/maximum/average response time of all tasks?

Table

Description automatically generated with low confidence

* Is any task missing the deadline? Which task? Where?

Table

Description automatically generated

Task 4 is missing the deadlines every period of 10ms, deadline should be 20, but the period causes the deadline to be 10ms, and not being able to follow this rate.

* If a deadline is missed, could it be avoided by changing the scheduler?

No, utilization is too high