

ASSIGNMENT 3

Name: K.Vishwanath

Course Title: Development of Real-Time System

Date: 20-06-2022

Assignment:

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)

Solution:

Tasks:

T1 (15, 1, 14)
T2 (20, 2, 26)
T3 (22, 3)

Requirement 1:

$$f \geq 3 \quad \left[f \geq \max_{1 \leq i \leq n} (e_i) \right]$$

e_i - execution time

Requirement 2:

Candidates divide H evenly:

$f = 3, 4, 5, 10, 11, 15, 20, 22$

Requirement 3:

$$2f - \gcd(p_i, f) \leq D_i$$

$f=3$

i) $2 \times 3 - \gcd(15, 3) \leq 14$
 $6 - 3 = 3 \leq 14$ (True)

ii) $2 \times 3 - \gcd(20, 3) \leq 26$
 $6 - 1 \leq 26$
 $5 \leq 26$ (True)

iii) $2 \times 3 - \gcd(22, 3) \leq 22$
 $6 - 1 \leq 22$ (True)
 $5 \leq 22$

So, f satisfies all conditions
Largest frame size; $f=3$

$$T_1(4, 1)$$

$$T_2(5, 2, 7)$$

$$T_3(20, 5)$$

Requirements:

$$f \geq \max(e_i) = 5$$

$$f \geq 5$$

But we can not have a frame size larger than period 4

We can divide the tasks:

$$T_3 \Rightarrow (20, 1), (20, 4)$$

So, now,

$$f \geq 4$$

$$2f - \gcd(P_i, f) \leq D_i$$

$$i) 2 \times 4 - \gcd(4, 4) \leq 4$$

$$8 - 4 \leq 4$$

$$4 \leq 4 \text{ (True)}$$

$$ii) 2 \times 4 - \gcd(5, 4) \leq 7$$

$$8 - 1 \leq 7$$

$$7 \leq 7 \text{ (True)}$$

$$iii) 8 - \gcd(20, 4) \leq 20$$

$$8 - 4 \leq 20$$

$$4 \leq 20 \text{ (True)}$$

\Rightarrow Largest frame size $f = 4$

$$T_1(5, 0, 1)$$

$$T_2(7, 1)$$

$$T_3(12, 6)$$

$$T_4(45, 9)$$

$$f \geq \max(e_i)$$

$$f \geq 9$$

But we cannot have a frame size larger than 5 and 7
So,

$$T_3 \rightarrow (12, 3), (12, 3)$$

$$T_4 \rightarrow (45, 3), (45, 3), (45, 3)$$

$$[f \geq 3]$$

$$f = 3, 4, 5, 6, 7, 9, 12, 15, 45$$

At $f=3$,

$$2f - \gcd(P_i, f) \leq D_i$$

$$i) \quad 2 \times 3 - \gcd(5, 3) \leq 5$$

$$6 - 1 \leq 5$$

$$5 \leq 5 \text{ (True)}$$

$$ii) \quad 2 \times 3 - \gcd(7, 3) \leq 7$$

$$6 - 1 \leq 7$$

$$5 \leq 7 \text{ (True)}$$

$$iii) \quad 2 \times 3 - \gcd(12, 3) \leq 12$$

$$6 - 3 \leq 12$$

$$3 \leq 12 \text{ (True)}$$

$$iv) \quad 2 \times 3 - \gcd(45, 3) \leq 45$$

$$6 - 3 \leq 45$$