EE5903

Solutions to Selected Problems

Chapter 2

2.1 Cyclic Scheduler For a given periodic task, a frame size is chosen when it satisfies all the constraints.

Constraint #1: $\max\{e_i\} \leq F$

$\Rightarrow \max\{1, 1, 1, 2\} = 2$

So, F should be at least 2

Const #2: major cycle $M = LCM(4, 5, 20)$

$\Rightarrow M = 20$

M should be an integral multiple of F, i.e., $M \bmod F = 0$. We can then check for possible values of F, i.e.,

$F \in \{2, 4, 5, 10, 20\}$

Const #3: We need to check

$\rightarrow 2F - \gcd(F, p_i) \leq d_i$ for each p_i

We need to consider d_i as p_i for each task. Hence we have:

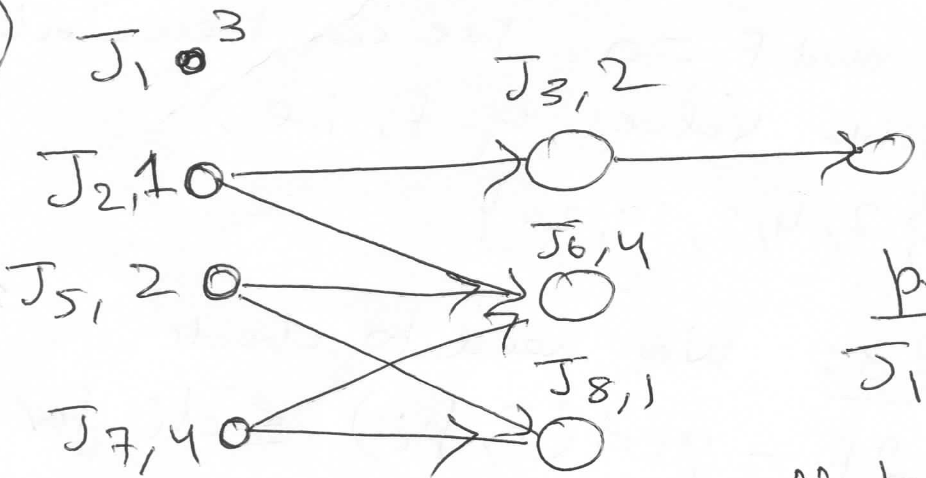
(2)

F	T_1	T_2	T_3	T_4	Remarks
2	✓	✓	✓	✓	Satisfied by all tasks
4	✓	✗	—	—	T_2 fails
5	✗	—	—	—	T_1 fails
20	✗	—	—	—	T_1 fails

▶ Example: $\underbrace{2 * 2 - \gcd(2,4)}_{2} \leq 4$

Thus, $F=2$ is a suitable frame size for scheduling the given set.

(2.2)

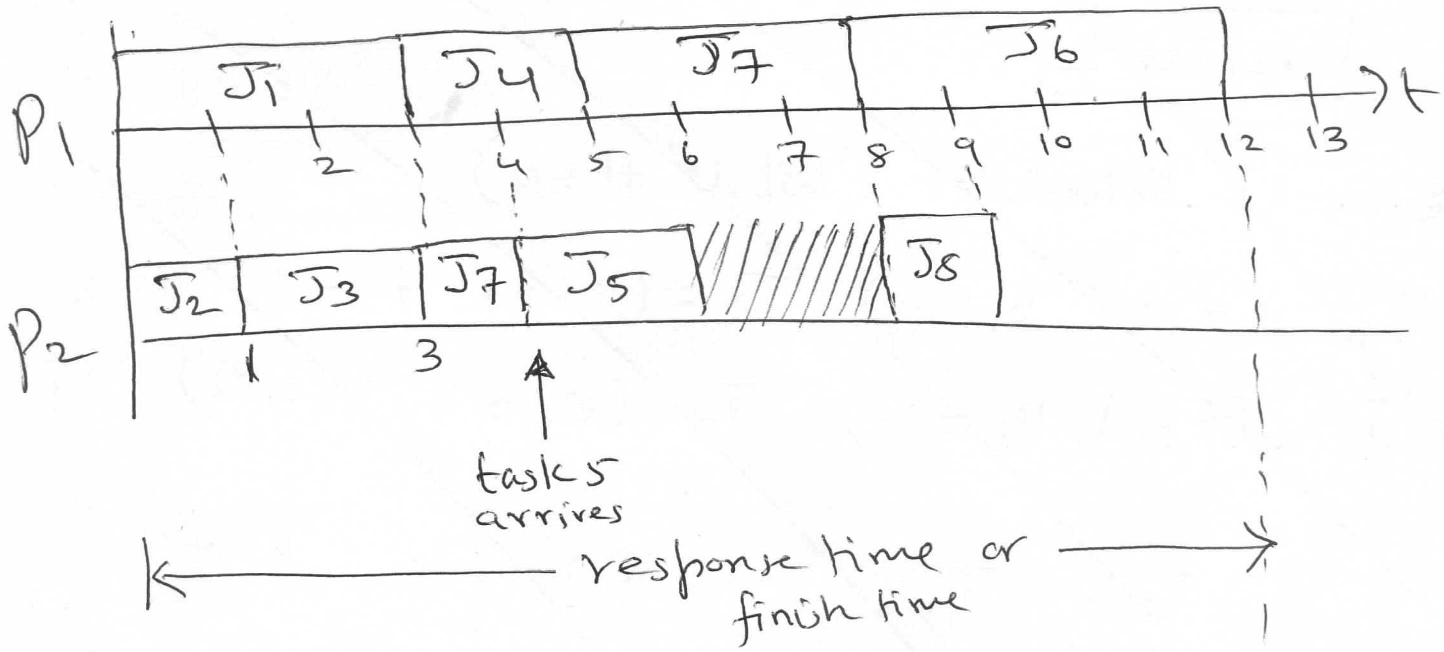


priority order

$J_1, J_2, \ldots, J_8$

- all tasks available from $t=0$ except task 5
- task 5 from $t=4$

(a) Preemptive with task migration

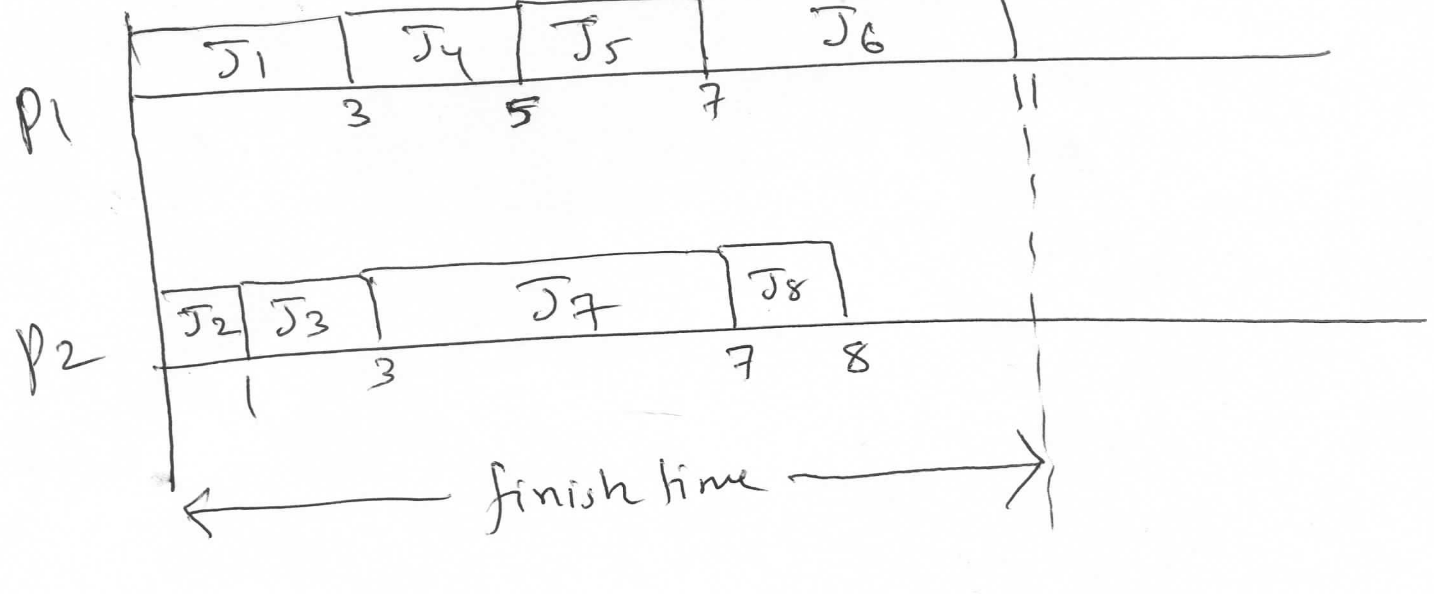


(b) Preemptive without task migration

This will yield finish time as 13
(recall we showed the solution in the class)

J7 should be held in P2

(c) Non-premptive



2.3

- Average Response time (ART)

$$= \frac{1}{n} \sum_{i=1}^{n} (f_i - a_i)$$

- Total Completion time

$$= \max_i \{f_i\} - \min_i \{a_i\}$$

- Weighted sum of completion times

$$= \sum_{i=1}^{n} w_i f_i$$

- Maximum lateness (L_{max})

$$= \max_i (f_i - d_i)$$

- Maximum # of late tasks (N_{late})

$$N_{late} = \sum_{i=1}^{n} miss(f_i)$$

where,

$$miss(f_i) = \begin{cases} 0 & \text{if } f_i \le d_i \\ 1 & \text{o.w} \end{cases}$$