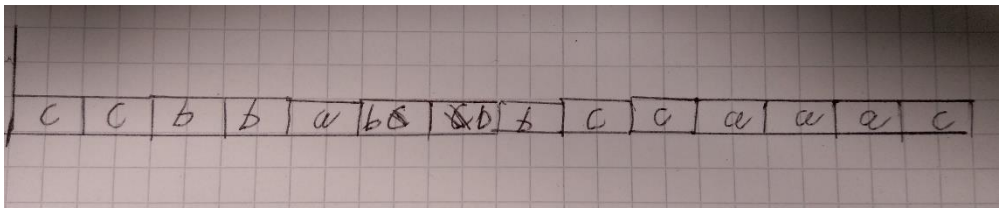
Task 1.1)

Tasks are assigned priority to maximize the overall program efficiency of a concurrent program. With the best timing behavior. One reason for doing this is that many tasks have a different deadline and completion time.

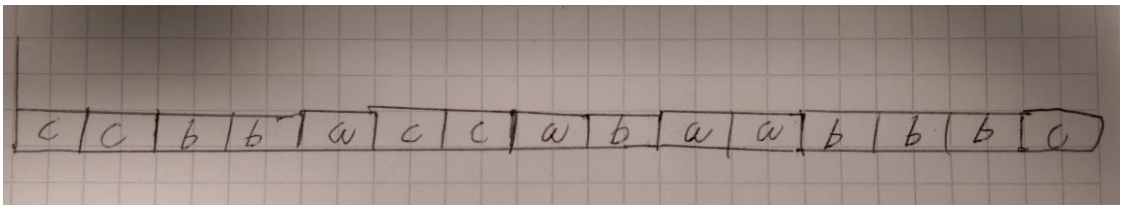
Task 1.2)

The major necessary feature of a scheduler in a real-time system is that it meets all deadlines. This may include being preemptive, which is nice to have.

Task 2.1)



Task 2.2)



Task 3.1)

Priority inversion is when a task of a certain priority has to wait for a task of lower priority to release a shared resource.

Unbounded priority inversion is when such an inversion is without time limit.

Task 3.2)

No.

Task 4.1)

We need the following assumptions

- A fixed number of task, which are periodic
- The tasks are independent
- The deadlines are equal to their periods, with fixed worst-case time
- No internal delay

Task 4.2)

We get the following

$$U = \sum_{i=1}^{n} \frac{C_i}{T_i} = \frac{15}{50} + \frac{10}{30} + \frac{5}{20} = \frac{53}{60} = 0.88 \leq n\left(2^{\frac{1}{n}} - 1\right) = 3\left(2^{\frac{1}{3}} - 1\right) = 0.78$$

The expression does not hold true, therefore the task set is not schedulable.

Task 4.3)

For b

$$\omega_b^1 = 10 + \left\lceil \frac{10}{50} \right\rceil * 15 = 13$$
$$\omega_b^2 = 10 + \left\lceil \frac{13}{50} \right\rceil * 15 = 14$$
$$\omega_b^3 = 10 + \left\lceil \frac{14}{50} \right\rceil * 15 = 15$$
$$\omega_b^4 = 10 + \left\lceil \frac{15}{50} \right\rceil * 15 = 15$$
$$\omega_b^3 = \omega_b^4 < 20$$

Still holds for b.

For c

$$\omega_c^1 = 5 + \left\lceil \frac{10}{50} \right\rceil * 15 + \left\lceil \frac{5}{30} \right\rceil * 10 = 30$$
$$\omega_c^1 > 20$$

Does not hold. The task set is not schedulable.