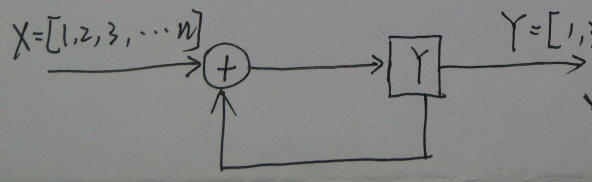
1435421 郑锐奇 M4.

1.1.1.

Determinacy: the output sequence of Algorithm 1 is not determined, because it obeys the 'First In First Out' rule.
But for Algorithm 2, it's determined, since for each token X_i, it has its own serial number and the number is unique in channel. so the sequence order is determined

Fairness: Algorithm 1 is fair, since it obeys FIFO rule, so nobody will starve.
Algorithm 2 is unfair. because only the one with smaller serial number will be served. Thus those who come earlier but have larger numbers will starve.

1.1.2.



$Y_t = X_t + Y_{t-1}$, $t=1,2,3,\cdots$
$Y_0 = 0$.

1.2.1. (a) $\begin{cases} a-b=0 \\ a-b=0 \end{cases}$ $M = \begin{bmatrix} 1 & -1 \\ 1 & -1 \end{bmatrix}$

Graph a is consistent, disconnected.
because $Mq=0$ has multiple solutions.
So $a=b=N$, N can be any positive integer.
each node must at least fire once ($N=1$).

(b) $\begin{cases} 2a-b=0 \\ a-b=0 \end{cases}$ $M = \begin{bmatrix} 2 & -1 \\ 1 & -1 \end{bmatrix}$

Graph b is inconsistent.
because $Mq=0$ has only all-zero solution.

1.2.2. let X for Ouelle, Y for DCT, Z for RLC.

we have
$$\begin{cases} X - Y = 0 \\ Y - Q = 0 \\ Q - Z = 0 \\ Z - 77C = 0 \\ C - R = 0 \\ 77R - Q = 0. \end{cases}$$

$$M = \begin{bmatrix} X & Y & Z & Q & C & R \\ 1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & 0 & -77 & 0 \\ 0 & 0 & 0 & 0 & 1 & -1 \\ 0 & 0 & 0 & -1 & 0 & 77 \end{bmatrix}$$

Obviously, let $C = R = k$, then $X = Y = Q = Z = 77k$, satisfy the equations.
k can be any integer.

so the graph is consistent.

The relative ~~num~~ number is $X = Y = Q = Z = 77C = 77R$.