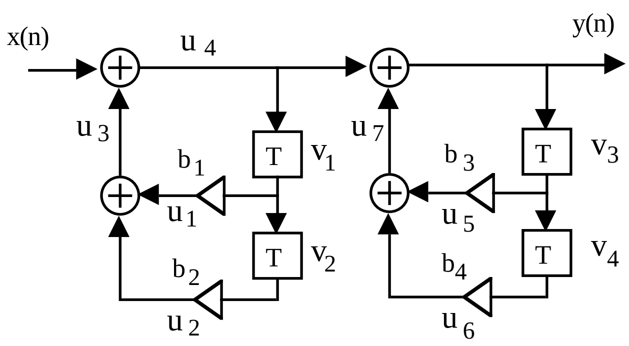
6.1 a) 1. Collapse nodes with transmittancies ±1.

2. Introduce node numbers according to the figure below.



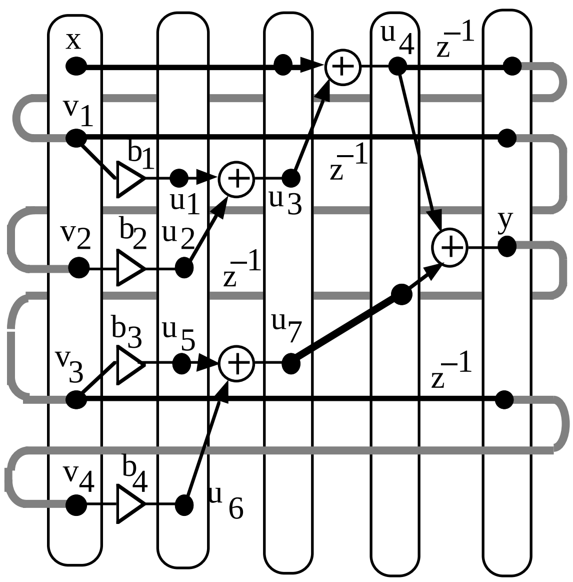
3. Remove all delay elements

4. Initial nodes : v_1, v_2, v_3, v_4, x
Executable operations: b_1, b_2, b_3, b_4
New nodes: u_1, u_2, u_5, u_6
Executable operations: +, +
New nodes: u_3, u_7
Executable operations: +
New nodes: u_4
Executable operations: +
New nodes: y

5. Complete the computation graph by adding the branches from the signal-flow graph. Note that the delay element $v_3(n)$ does not correspond to physical memory.

b) The system of difference equations is

$u_1 := b_1\, v_1(n)$
$u_2 := b_2\, v_2(n)$
$u_5 := b_3\, v_3(n)$
$u_6 := b_4\, v_4(n)$
$u_3 := u_1 + u_2$
$u_7 := u_5 + u_6$
$u_4 := u_3 + x(n)$
$y(n) := u_4 + u_7$
$v_2(n+1) := v_1(n)$
$v_4(n+1) := v_3(n)$
$v_1(n+1) := u_4$
$v_3(n+1) := y(n)$



An intermediate node (u_i) can be eliminated if it appears only in one place on the right hand side. Thus, we can, for example, eliminate u_1. We get

$u_4 := b_1\, v_1(n) + b_2\, v_2(n) + x(n)$
$y(n) := u_4 + b_3\, v_3(n)+ b_4\, v_4(n)$
$v_2(n+1) := v_1(n)$
$v_4(n+1) := v_3(n)$
$v_1(n+1) := u_4$
$v_3(n+1) := y(n)$

c)