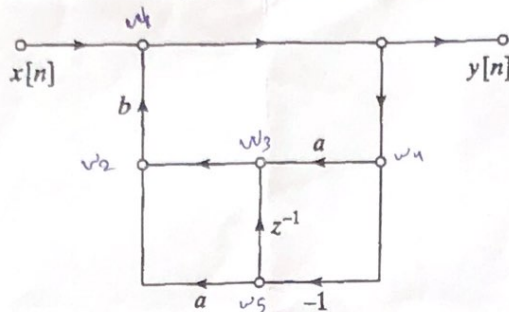


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The flow graph shown in the following figure is noncomputable; i.e. it is not possible to compute the output using the difference equations represented by the flow graph because it contains a closed loop having no delay elements.



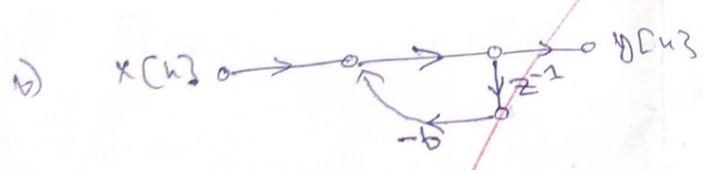
a) Write the difference equations for this system, and from them, find the system function, $H(z)$, of the network.

b) From the system function, obtain a flow graph that is computable.

$$\begin{aligned}
 w_1[n] &= x[n] + b w_2[n] & \text{--- (1)} \\
 w_2[n] &= w_3[n] + a w_5[n] & \text{--- (2)} \\
 w_3[n] &= a w_4[n] + w_5[n] & \text{--- (3)} \\
 w_4[n] &= y[n] & \text{--- (4)} \\
 w_5[n] &= -w_4[n] & \text{--- (5)} \\
 y[n] &= w_1[n] & \text{--- (6)}
 \end{aligned}$$

$$\begin{aligned}
 \text{(1) \& (5)} & \Rightarrow w_5[n] = -w_1[n] & \text{--- (7)} \\
 \text{(1) \& (2)} & \Rightarrow w_1[n] = x[n] + b w_3[n] + a b w_5[n] & \text{--- (8)} \\
 \text{(3) \& (4)} & \Rightarrow w_1[n] = x[n] + b a w_4[n] + b w_5[n] & \text{--- (9)} \\
 \text{(9) \& (6)} & \Rightarrow y[n] = x[n] + a b y[n] - b y[n-1] & \text{--- (10)} \\
 & \Rightarrow a b y[n] & \text{--- (11)} \\
 & \Rightarrow y[n] + b y[n-1] = x[n] & \text{--- (12)}
 \end{aligned}$$

$$\Rightarrow Y(z) + b Y(z) z^{-1} = X(z) \Rightarrow H(z) = \frac{1}{1 + b z^{-1}}$$



Direct Form I
 Computable.