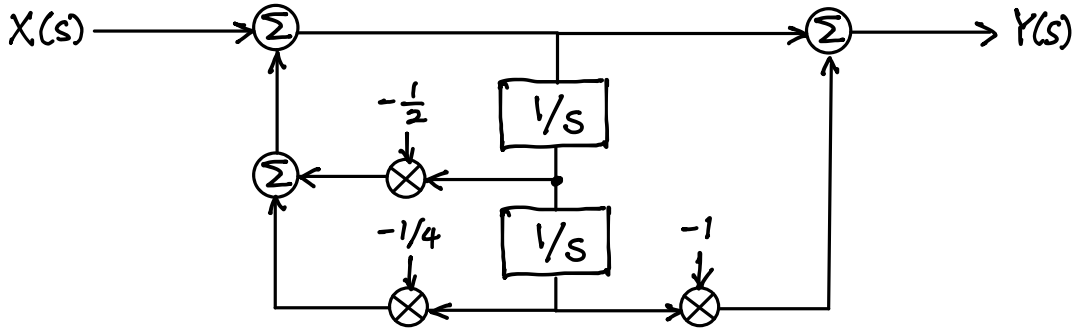
Example 4.3: An LTI described by an LCCDE has the following DFII implementation.



Write the input-output LCCDE.

Solution:
Since there are two integrators, we recognize $n = 2$. From the DFII implementation, we identify

$$\begin{aligned} -\frac{a_1}{a_0} &= -\frac{1}{2}, \ -\frac{a_2}{a_0} = -\frac{1}{4}, \\ \frac{b_0}{a_0} &= 1, \ \frac{b_1}{a_0} = 0, \ \frac{b_2}{a_0} = -1. \end{aligned} \tag{E1}$$

Set $a_0 = 4$ and find[1]

$$a_1 = 2, \ a_2 = 1, \ b_0 = 4, \ b_1 = 0, \ b_2 = -4. \tag{E2}$$

Hence, the LCCDE is

$$4\frac{d^2y(t)}{dt^2} + 2\frac{dy(t)}{dt} + y(t) = 4\frac{d^2x(t)}{dt^2} - 4x(t). \tag{E3}$$

[1] $a_0 (\neq 0)$ is a constant scaling factor of the LCCDE.