ECE 2050 Autumn 2023 Homework 5
Due 5:00 pm, Friday October 6, 2023
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BC:5.1 In the flow diagram shown in Fig. 1, the blocks with the "D" represent a one-step time delay. Find the difference equation in the form

$$\sum_{k=0}^{N} a_k y[n-k] = \sum_{p=0}^{M} b_p \; x[n-p]$$

where $a_0 = 1$.

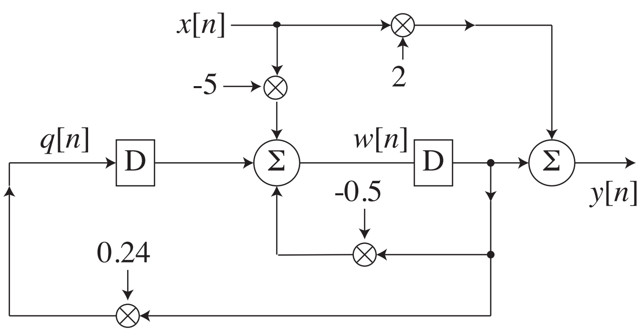

Figure 1: Flow diagram for Problem BC: 5.1

BC:5.2 In the flow diagram shown in Fig. 2, the blocks with the "D" represent a one-step time delay. Find the difference equation in the form

$$\sum_{k=0}^{N} a_k y[n-k] = \sum_{p=0}^{M} b_p \; x[n-p]$$

where $a_0 = 1$.

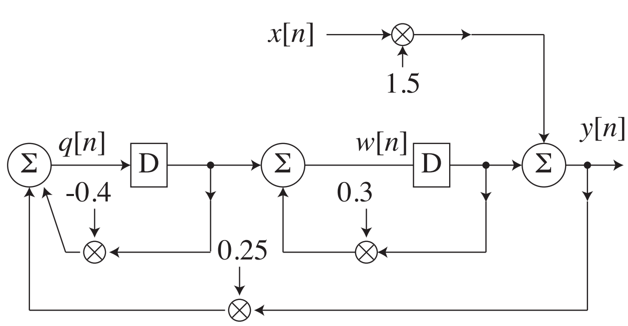

Figure 2: Flow diagram for Problem BC: 5.2

BC:5.3 In the flow diagram shown in Fig. 3, the blocks with the "D" represent a one-step time delay. Find the difference equation in the form

$$\sum_{k=0}^{N} a_k y[n-k] = \sum_{p=0}^{M} b_p \; x[n-p]$$

where $a_0 = 1$.

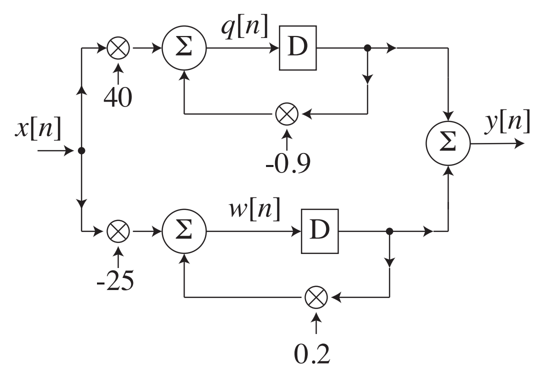

Figure 3: Flow diagram for Problem BC: 5.3

BC:5.4 Let $x[n]$ represent the number of automobiles produced by a factory on a given day, n. Let the inventory (total number of completed cars at the factory) at the end of day n be represented by $q[n]$. Each day the factory ships 5/6 of the previous day's inventory and holds the remaining 1/6 of the previous day's inventory for one full day of driving tests. The cars being tested on day n are included in the inventory count for day n. The day after testing, all of the tested cars are shipped. Let $y[n]$ represent the number of cars shipped on day n. Specify a flow diagram and a difference equation (in standard form) that describe together the number of cars shipped as a function of number of cars produced and the history of the number of cars shipped.