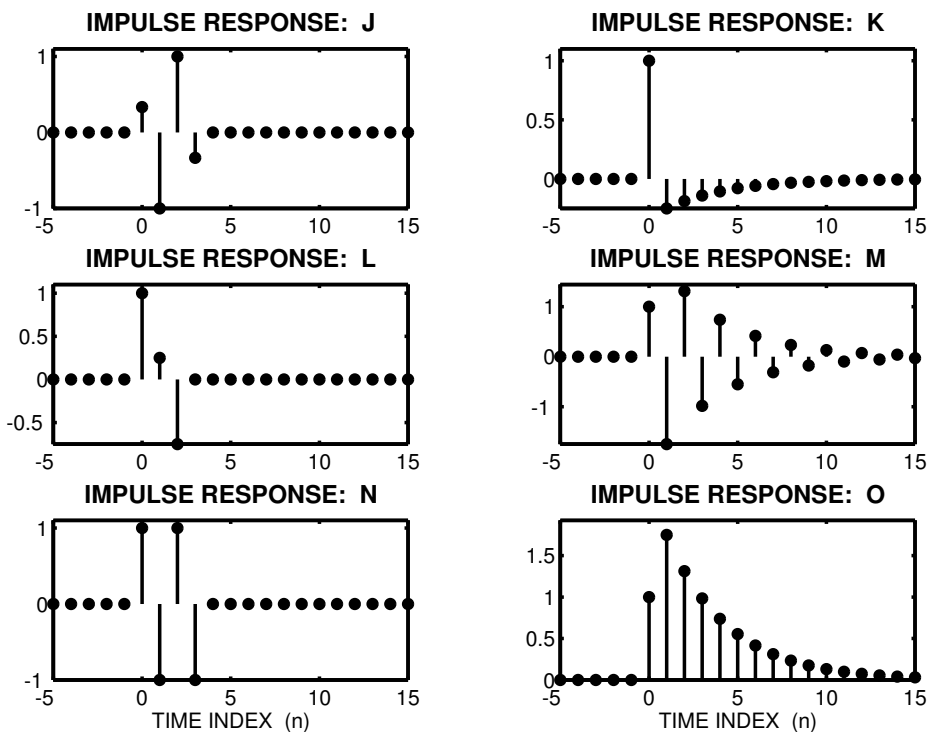


PROBLEM:

This problem has been given before on exams. It would be good review.



For each of the impulse-response plots (J, K, L, M, N, O), determine which one of the following systems¹ (specified by either an $H(z)$ or a difference equation) matches the impulse response. In addition, derive a formula for the impulse response, $h[n]$, for \mathcal{S}_1 and \mathcal{S}_4 .

$$\mathcal{S}_1 : \quad y[n] = 0.4y[n-1] + x[n] + x[n-1]$$

$$\mathcal{S}_2 : \quad H(z) = \frac{1 + z^{-1}}{1 - 0.75z^{-1}}$$

$$\mathcal{S}_3 : \quad y[n] = -0.75y[n-1] + x[n] - x[n-1]$$

$$\mathcal{S}_4 : \quad H(z) = \frac{1 - z^{-1}}{1 - 0.75z^{-1}}$$

$$\mathcal{S}_5 : \quad y[n] = x[n] - x[n-1] + x[n-2]$$

$$\mathcal{S}_6 : \quad H(z) = 1 - z^{-1} + z^{-2} - z^{-3}$$

$$\mathcal{S}_7 : \quad y[n] = x[n] + \frac{1}{4}x[n-1] - \frac{3}{4}x[n-2]$$

$$\mathcal{S}_8 : \quad H(z) = \frac{1}{3}(1 - z^{-1})^3$$

¹These 8 systems are exactly the same as the next matching problems.