IC-260: SIGNALS & SYSTEMS

TUTORIAL-5: SOLUTION

Please refer the book "SIGNALS & SYSTEMS" (2nd Ed.) – A. V. OPPENHEIM, A. S. WILLSKY, S. H. NAWAB. for Q.1, Q.2 and Q.4.

Q.1 → Example 5.13.

Q.2 → Example 5.14.

Q.4 – a → Example 9.33.

b → Similar to Example 9.4 except the sin3t.

$$x(t) = e^{-2t}u(t) + e^{-t}(\sin 3t)u(t)$$

$$= \left[e^{-2t} + \frac{1}{2j}e^{-(1-3j)t} - \frac{1}{2j}e^{-(1+3j)t}\right]u($$

Rest is similar to example 9.4.

Q.3 From the given $x[n]$ & $y[n]$, we have to find $h[n]$ & $H(e^{jw})$.

$$h[n] \xleftrightarrow{F} H(e^{jw}) = \frac{Y(e^{jw})}{X(e^{jw})}$$

* One can find easily $Y(e^{jw})$ & $X(e^{jw})$ by using the Fourier Transform property. Then use partial fraction method to split $H(e^{jw})$ and invert it to the time domain to find $h[n]$.

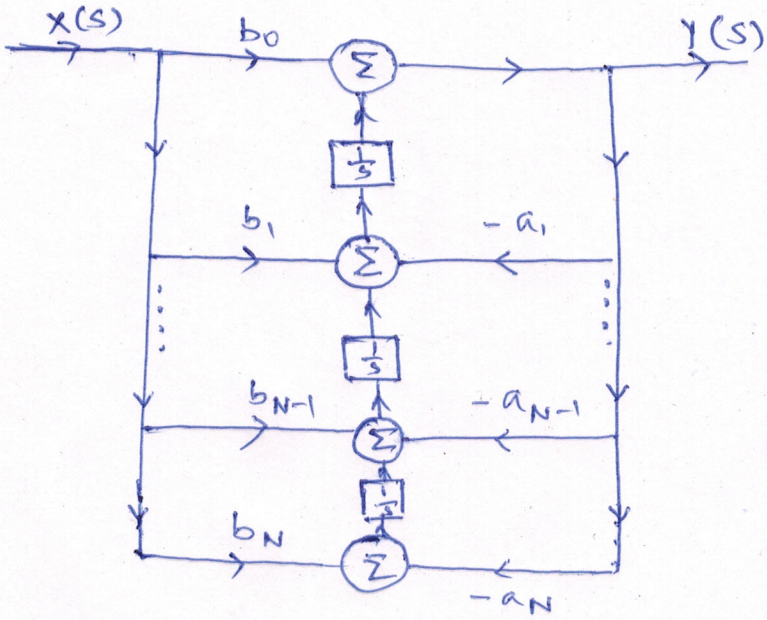
Q.5 Hint:

→ Find Y(s) & X(s) using L.T. properties.

→ Find H(s), which will be of the form:

$$H(s) = \frac{b_0 s^N + b_1 s^{N-1} + \cdots + b_{N-1} s + b_N}{s^N + a_1 s^{N-1} + \cdots + a_{N-1} s + a_N}$$

For this block-diagram realization will be:

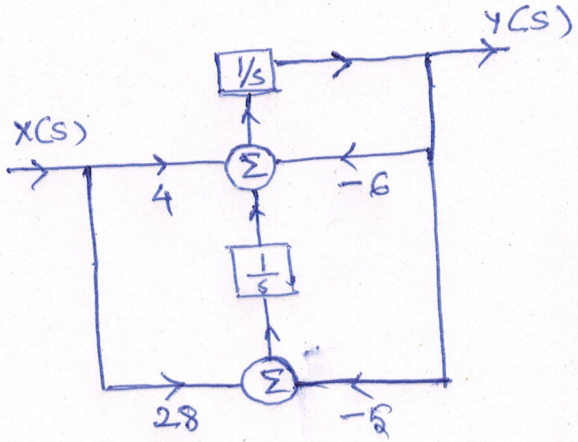


The H(s) for the problem will be $\frac{4s+28}{s^2+6s+5}$.

So, Here $N = 2$;

$b_0 = 0$, $b_1 = 4$, $b_2 = 28$; $a_1 = 6$, $a_2 = 5$.

According to these parameters the above block diagram can be modified as:



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