Problem 10.5

Given, the impulse response of LTI system is $h[n] = 10(\sqrt{2})^{-n}u[n]$ and input signal is $x[n] = \delta[n] + \beta\delta[n-2] + \delta[n-4]$. Required to find value of β so output $y[n] = 0$ for $n \geq 4$.

$y[n] = x[n] * h[n] = h[n] + \beta h[n-2] + h[n-4]$

$= 10(\sqrt{2})^{-n}u[n] + \beta 10(\sqrt{2})^{-(n-2)}u[n-2] + 10(\sqrt{2})^{-(n-4)}u[n-4]$

For $n >= 4, u[n] = u[n-2] = u[n-4] = 1$.

Then, $y[n] = 10(\sqrt{2})^{-n}[1 + \beta 10(\sqrt{2})^2 + (\sqrt{2})^4]$

$[1 + \beta 10(\sqrt{2})^2 + (\sqrt{2})^4]$ should be zero for $y[n] = 0$.

Therefore, $1 + 2\beta + 4 = 0 \implies \beta = -2.5$