

Re: Solution to Fo4 Exam 3 Prob. 1(c)

$x[n]$ periodic of period 12, $y_2[n]$ periodic of period 9.

The

$$\text{LCM}(12, 9) = 36$$

so to answer this question we have to look at these sequences as being periodic of period 36. Note

$$36 = 12 \cdot 3 = 9 \cdot 4$$

Let X_k denote the 12-periodic DTFS of $x[n]$ and let Y_k denote the 9-periodic DTFS of $y[n]$.

Then using the result of Fo5 Exam 3 Prob. 2(b) have

$$\tilde{X}_k = \begin{cases} X_{k/3} & k \text{ a mult. of } 3 \\ 0 & \text{else} \end{cases} \quad k=0, 1, 2, \dots, 35$$

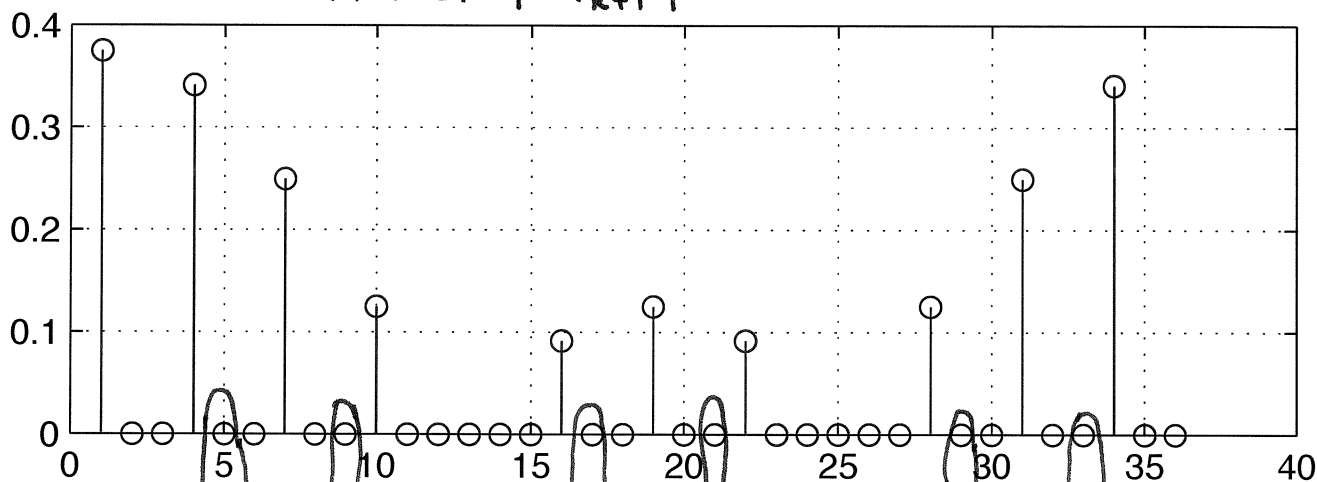
$$\tilde{Y}_k = \begin{cases} Y_{k/4} & k \text{ a mult. of } 4 \\ 0 & \text{else} \end{cases} \quad k=0, 1, 2, \dots, 35$$

Then in order for there to be an LTI syst. taking $x[n]$ to $y_2[n]$ we must have

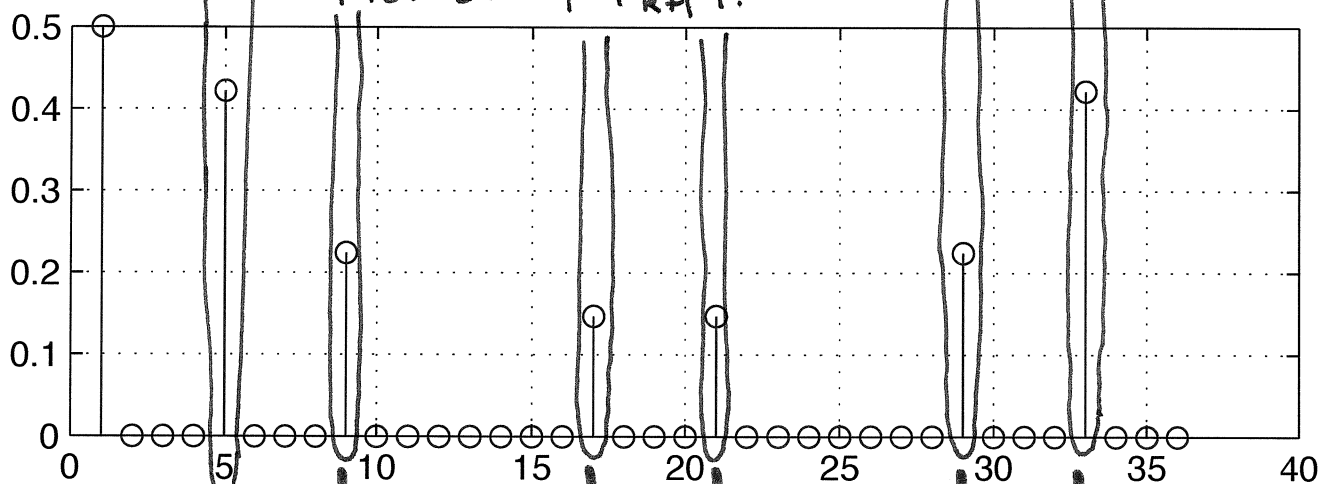
$$\tilde{X}_k = 0 \implies \tilde{Y}_k = 0$$

But this does not work here. See plot of Matlab computation on following page.

Plot of $|\tilde{X}_{k+1}|$



Plot of $|\tilde{Y}_{k+1}|$



requirement $\tilde{X}_k = 0 \Rightarrow \tilde{Y}_k = 0$
 is violated here.