台灣聯合大學系統101學年度碩士班招生考試命題紙 共 2 頁第 / 頁

科目: 訊號與系統(300B)

校系所組:中央大學電機工程學系(系統與生醫組)

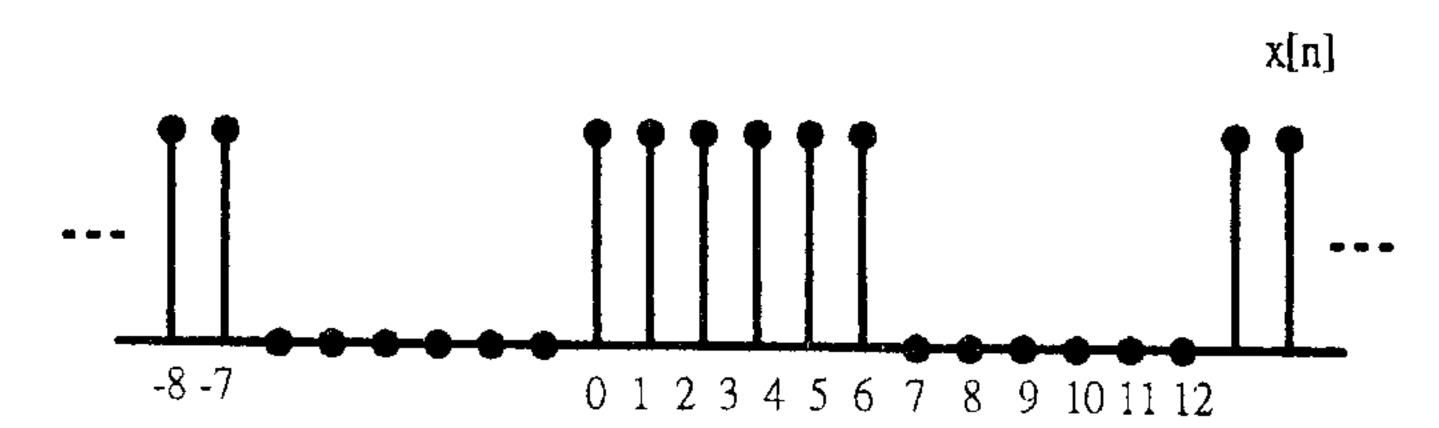
交通大學生醫工程研究所(乙組)

清華大學電機工程學系(乙組、丁組)

- \((5\%)\) Please define a linear system in terms of mathematical expression.
- `(10%) Please define the properties of causality and stability for a Linear Time-Invariant (LTI) System in terms of mathematical expression.
- \equiv (10%) Please define an eigenfunction for an LTI system with impulse response h(t); and show its transfer function H(s) as the corresponding eigenvalue.
- 四、(15%) The linear convolution of a length-100 sequence with a length-1500 sequence is to be computed using 128-point DFTs and IDFTs.
 - (-) (8%) Determine the smallest number of DFTs and IDFTs needed to compute the above linear convolution using the overlap-add approach.
 - (=) (7%) Determine the smallest number of DFTs and IDFTs needed to compute the above linear convolution using the overlap-save approach.

五、(15%)

(-) (8%) Derive and plot the discrete Fourier series X[k] of a periodic rectangular pulse x[n], whose period is N = 12 as shown in the following figure. Please derive both the magnitude and phase sequences.



- (=) (7%) Derive the Fourier transform $X(e^{j\omega})$ of one period $\hat{x}[n]$ of x[n]. Please plot the magnitude and phase of $X(e^{j\omega})$. (7%)
- 六、(15%) An LTI system is described by the difference equation:

$$y[n] = x[n] - 3x[n-1] + 3x[n-2] - x[n-3].$$

What is the output if the input is $x[n] = 10 + 4\cos(0.5\pi n + \pi/4) + 5\delta[n-3]$?

注:背面有試題



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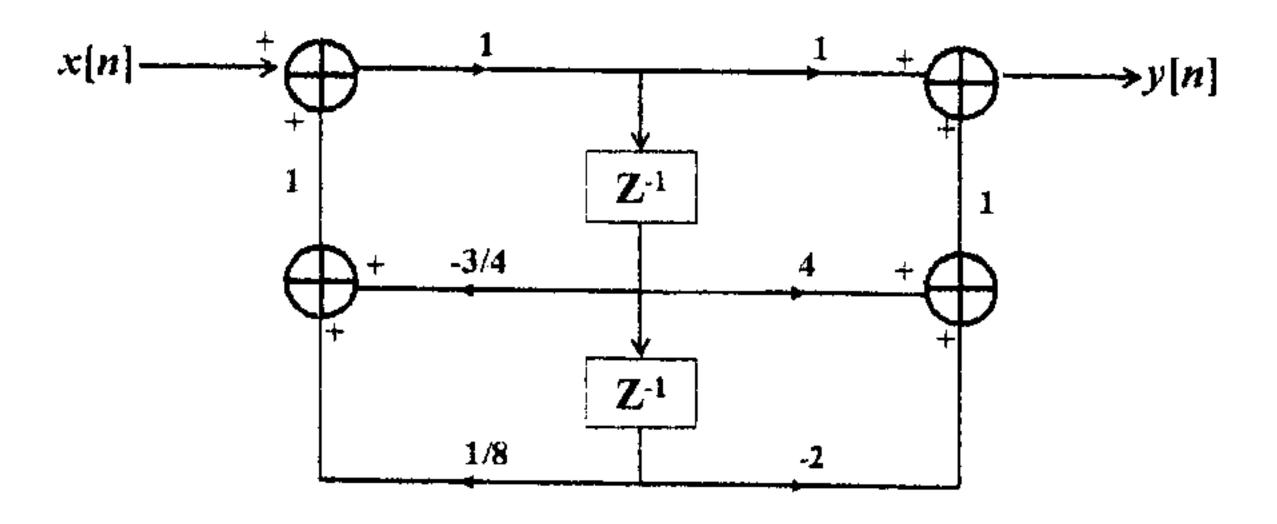
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to (15%) For a discrete-time multiplier with two input signals x[n] and h[n], the two signals are x[n] = u[n] - u[n-6] and $h[n] = a^n u[n]$, where u[n] is the unit step function with unity gain for $n \ge 0$. The system output y[n] can be expressed as $y[n] = x[n] \cdot h[n]$, where represents the multiplication operator.

- (-) (8%) Please determine the Z-transform Y(z) of system output y[n].
- (=) (7%) Please plot the pole(s) and zero(s) of Y(z) and indicate its Region of Convergence (ROC).
- 八、(15%) Consider a signal flow graph shown in the following figure.



- (-) (8%) Please find the transfer function H(z).
- (二) (5%) Please find the impulse response, h[n], of the system.
- (三) (2%) Is the system stable? Please explain it.