

Digital Signal Processing and Wireless Communications (PDE2103)

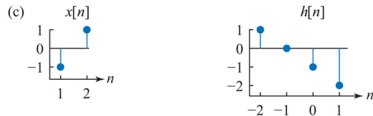
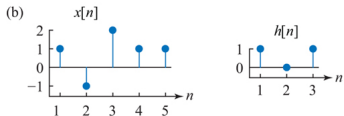
Dr. Tuan Anh Le

Lab Report 2:

**Impulse Response, Discrete-time Fourier Transform,
Discrete Fourier Transform**

Question 1

Find $y[n] = x[n] * h[n]$ of the pair $x[n]$ and $h[n]$ shown in figures (b) and (c):



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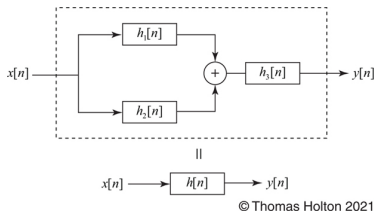
- Hint: using the same approach as in Example 2.3 in the Revision on Week 11.

Question 2

Given the system shown below with

$$h_1[n] = \delta[n] - \delta[n - 1], h_2[n] = 2\delta[n - 1] + \delta[n + 1],$$

$$h_3[n] = \delta[n + 1] - \delta[n - 1].$$



Find

- The equivalent impulse response of the system, $h[n]$.
- The response of the system when $x[n] = \delta[n + 1] - \delta[n]$.

Hint: using the same approach as in Problem 2-19 in the Revision on Week 11.

Question 3

Find the DTFTs, i.e., system functions, of the following systems:

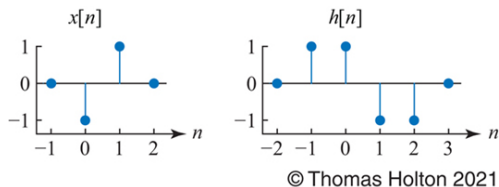
a) $h[n] = -\delta[n + 4] + \delta[n - 2]$

b) $h[n] = \delta[n + 2] - 2\delta[n] + 3\delta[n - 1] - 2\delta[n - 3]$

Hint: using the same approach as in Example 3.10 in the Revision on Week 11.

Question 4

Find the convolution of the two sequences $x[n]$ and $h[n]$ shown below



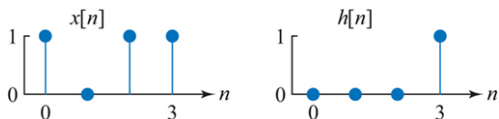
by

- a) Time-domain convolution method (i.e., the direct-summation method)
- b) Frequency-domain convolution method (i.e., the transform-multiplication method)

Hint: using the same approach as in Example 3.26 in the Revision on Week 11.

Question 5

Find the 4-point DFTs $X[k]$ and $H[k]$ of $x[n]$ and $h[n]$ shown below



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Hint: using the same approach as in Example of Matrix representation of the DFT with $N = 3$ in the Revision on Week 11.

Notes on the lab submission

- You need to show full working leading to the final answer to each question.
- You can complete the Report by handwriting, MS Word, etc. However, the final file for uploading to the module page has to be in pdf format.
- You need to name your final pdf file as "PDE2103_Report02_Firstname_Lastname_StudentID.pdf". For example, PDE2103_Report02_Tuan_Le_M00778888.pdf