

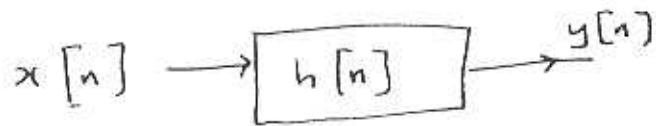
EE 424- Digital Signal Processing  
Midterm Exam  
Fall Semester 2004

Duration: 90 minutes.

Attempt all questions and show your work.

\*) Consider the following L.T.I. system characterized by the impulse response  $h[n] = \left\{ -\frac{1}{2}, 1, -\frac{1}{2} \right\}$

$\uparrow$   
 $n=0$



- Is this a causal system? Explain.
- Find the frequency response  $H(e^{j\omega})$  of  $h[n]$ .
- Is this a low-pass or a high-pass filter?
- Let  $x[n] = \left\{ 1, 2, 2 \right\}$ . Find  $y[n]$ .

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 $n=0$

2) a) Use  $N=5$  point DFT to compute the convolution of  $x[n] = \{1, 2, 2\}$  and  $h[n] = \{-\frac{1}{2}, 1, -\frac{1}{2}\}$  and

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 $n=0$

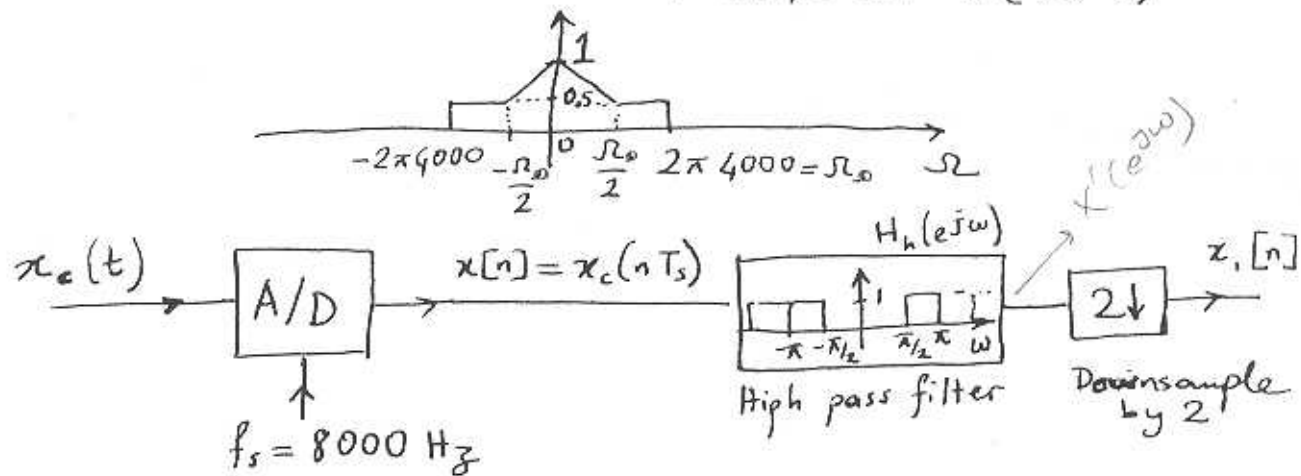
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 $n=0$

b) Can you use  $N=4$  point DFT to compute  $y[n] = h[n] * x[n]$ ? Explain

Find  $v[n] = \text{IDFT}_4^{-1} \{ H_4[k] X_4[k] \}$

where  $H_4[k]$  and  $X_4[k]$  are 4-point DFT's of  $h[n]$  and  $x[n]$ , respectively.

3) Let  $x_c(t)$  be a continuous time signal with continuous-time Fourier Transform  $X_c(j\Omega)$



Plot the frequency domain functions:  $X(e^{j\omega})$  and  $X_1(e^{j\omega})$ .

4) Draw the flow-diagram of the  $N=6$ -point Decimation-in-time Discrete-Fourier Transform Algorithm. Show your equations and work!