

EE 123 DIGITAL SIGNAL PROCESSING, Spring 2009  
Homework # 6, Due March 12, Thursday

1. Problem 8.30, Oppenheim and Schaffer, 2nd ed.
2. Problem 8.32, Oppenheim and Schaffer, 2nd ed.
3. Problem 8.44, Oppenheim and Schaffer, 2nd ed.
4. Write a MATLAB program to implement the *overlap-save* method for block convolution. (You can use the `fft` and `ifft` commands in implementing the circular convolutions.) To demonstrate your program:
  - a) Generate a sequence of the form:

$$x[n] = n(0.95)^n + r[n], \quad n = 0, \dots, 99$$

where, for each  $n$ ,  $r[n]$  is a random variable which is uniformly distributed in the interval  $[-0.5, 0.5]$ .

- b) Perform the convolution  $y[n] = h[n] * x[n]$  where  $h[n]$  is the impulse response of the moving average filter:

$$h[n] = \begin{cases} 1 & n = 0, 1, 2, 3; \\ 0 & \text{otherwise.} \end{cases}$$

Compare the result to that obtained from the `fftfilt` command of MATLAB, which uses the *overlap-add* method.

- c) Plot  $y[n]$  and compare with  $x[n]$  to see to what extent the noise  $r[n]$  has been removed by the moving average filter.
5. Problem 8.65, parts (a),(b),(c), Oppenheim and Schaffer, 2nd ed.