

Homework Assignments

Homework set # 1, due Fri. Jan. 9

Problem 3.3

Problem 3.4

Problem 3.23

Homework set # 2, due Thurs. Jan. 15

Problem 3.26

Problem 3.28

Problem 3.32

Problem 3.51

Homework set # 3, due Thurs. Jan. 22

Problem 3.40

Problem 3.42

Problem 3.49

The following three problems are taken from the handout on contour integration, Oppenheim and Schaffer 1st edition.

Problem 4.36 a), d), e)., 1rst ed.

Problem 4.38, 1rst ed.

Problem 4.40, 1rst ed.

Homework set # 4, due Jan. 29

From your second ed. text:

Problem 4.15

Problem 4.25

Problem 4.44

Problem 4.52

Problem 4.59

Homework set # 5, due Feb 5

Problem 8.32

Problem 8.52

(note this is the basis for developing the FFT in the next chapter)

Problem 8.42

For part b), compute the DFT to approximate the DTFT (i.e. zero pad to a longer DFT size) of the two sequences (MATLAB FFT function, calculator, or other computed solution acceptable) and explain why these results support your conclusion.

Problem 8.63

Problem 8.64

Homework set # 6, due Feb 12

Problem 9.1

Problem 9.15

Problem 9.16

Homework set # 7, due Feb 19

Problem 9.33

Problem 9.31

Problem 9.28

Problem 9.53 (Refer to lecture notes)

Using any appropriate computer language, write a subroutine for computing an N point FFT recursively. Assume N is a power of 2. Submit your source code listing and output data for an input signal of: (Note: this is easier to do in a very high level language such as MATLAB or Mathematica, which are available on the college systems, but do not use the built in FFT functions)

$$x[n] = \cos \frac{n\pi}{4}, \quad 0 \leq n \leq 31.$$

Problem 5.17

Homework set # 8 due Feb. 26

Problem 5.39

Problem 5.22

Given two minimum phase sequences, $h_1[n]$ and $h_2[n]$, is $h_1[n] * h_2[n]$ minimum phase? Prove your conclusion.

Problem 5.15

Homework set # 9 due Mar. 5

Problem 5.41

Problem 5.43

Problem 7.21

Problem 7.2

Problem 7.3

Problem 7.25

Homework set # 10 due Mar. 12

Problem 7.32

Problem 7.34

Problem 7.5

Also, use MATLAB to compute the impulse response using windowed filter design techniques.

Problem 7.6

Homework set # 11 due Mar. 19

Problem 7.36

Also, use MATLAB to compute the impulse response and frequency response using `remez` (the Parks - McLellan algorithm) and `freqz`.

Problem 7.57

Also, use MATLAB to compute the impulse response and frequency response using `remez` (the Parks - McLellan algorithm) and `freqz`.

Homework set # 12 due Mar. 26

Problem 7.55

Problem 7.53

Problem 7.51

Problem 11.1

Homework set # 13 due Apr. 2

Problem 11.4

Problem 11.5

Homework set # 14 due Apr. 9

Problem 11.26

Problem 10.26

Problem 10.34

Problem 10.36

Problem:

$x(t)$ is an amplitude modulated upper single sideband radio signal with suppressed carrier at frequency ω_0 . $x(t) = A(t) \cos(\omega_0 t + \phi(t))$ where $A(t)$ and $\phi(t)$ are the magnitude and phase respectively of the complex analytic signal representation of the real audio modulation

signal $a(t)$. $\frac{\omega_0}{2\pi} = 455$ kHz, and $a(t)$ contains

energy only in the band 300 z to 3.0 kHz. $x[n]$ is generated by sampling $x(t)$ at $f_s = 1.2$ MHz. You will specify how to demodulate $x[n]$ to obtain $a[n]$.

Design a digital system to accomplish this using only linear operations. We will assume that noise and other interfering signals exist in adjacent frequencies so we must include filtering to reject them. All filtering must be done using lowpass filters only. Out of band noise must be attenuated at least 50 dB. Specify filter performance parameters (corner frequencies,

stopband attenuation, etc.) and required filter length.

Your design must be computationally efficient, so decimation must be used in the appropriate stages. At the output, $a[n]$ must be sampled at a reduced rate f_s which is the least possible integer sub multiple of f_s which does not produce aliasing. Draw a block diagram and indicate all parameters (e.g. frequencies of local signals, filter bandwidths, decimation rate, etc.) Also draw plots showing the spectrum at each stage of the processing.

Homework set # 15 due TUESDAY Apr. 14

Problem 10.3

Problem 10.17

Problem 10.32

Problem 10.40 a), b), c).