Q.2a. Explain Periodic Sampling with an impulse train

Ans. 4.1 of page 140-142 of text book

b.Comment on how oversampling and subsequent discrete time filtering and down sampling can permit an increase in step size of the quantizer.

Ans. 4.9 of page 201-205 of text book

Q.3a. Consider the LTI system with input and output related through the difference equation

$$y[n] + \frac{1}{4} y[n-1] = x[n] + \frac{1}{2} x[n-1]$$

(i) Find the system function and ROC
(ii) Give the pole-zero plot
(iii) Comment on the causality and stability of this system

Ans- 5.2 of page 245-247 of text book

b.What is Frequency-Response compensation? Illustrate distortion compensation by linear filtering.

Ans. Soln.5.6.2, Page No. 308, Fig.5.25

Q.4a. Give the basic network structures for FIR Systems.

Ans- 6.5 page no, 366-370 of text book

b.Explain signal flow-graph representation of linear constant-coefficient difference equations.

Ans. Soln. 6.2, Page No. 374-375

Q.5 a. Explain the design of FIR filters using Windowing, giving properties of all the common windows.

Ans. 7.2, Page No. 356-359

b.The Bilinear Transformation is used to design an ideal discrete time LPF with cutoff frequency ($\omega_c = 3\pi/5$) from an ideal continuous time LPF with cutoff frequency $\Omega_c = 2\pi(300)$ rad/s. Find T. Is this value of T unique?

Ans. 7.1, Page No. 515 Unsolved question 7.14
$\Omega_c = 2/T \tan(\omega_c/2)$
T=1.46;This T is unique.

Q.6a. Find out the DFT for a finite duration sequence x[n] with period N=5

Ans. 8.5 Page 561-562 of Text book.

b.Compute the Circular Convolution of two rectangular pulses where

$$x_1[n] = x_2[n] = \begin{cases} 1 & 0 \le n \le L-1 \\ 0 & \text{otherwise} \end{cases}$$ **, where L=6**

Ans. 8.6 Page 573-575 of Text book

Q.7 a. Discuss the issues associated with accessing and storing data in the intermediate arrays of the FFT.

Ans. 9.5 Page 652-654 of Text book

b.Explain DIT- FFT Algorithm using signal flow graphs for N=8. Compare its computational complexity with DFT.

Ans. 9.3 Page 635-639 of Text book

Q.8 a. Explain how Fourier Analysis is done for non stationary signals.

Ans 10.5 Page 723-725 of Text book

b.Describe how DFT is helpful in the spectrum analysis of random signals.

Ans 10.7 Page 743-754 of Text book

Q.9 a. What is Hilbert Transformer?

Ans 11.4 Page 792-793 of Text book

b.Give the Real and Imaginary-part sufficiency of the Fourier Transform for causal sequence.

Ans 11.1 of Page no. 803-805 of text book

Textbook

I. Discrete-Time Signal Processing (1999), Oppenheim, A. V., and Schafer, R.