SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY :: PUTTUR

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QUESTION BANK (DESCRIPTIVE)

Subject : Advanced Digital Signal Processing(18EC4002) **Course & Branch**: M.Tech - DECS

Year & Sem: I-M.Tech & I-Sem **Regulation:** R18

UNIT 1

1) Explain the classification of discrete time signals and systems. 10M

2) a) Describe the linear time invariant system. 5M

b) Explain the properties of LTI system. 5M

3) Explain frequency domain representation of signals and systems in detail 10M

4) Consider causal and stable LTI system whose I/Ps and O/Ps are related through second order difference equation y(n)-(1/6) y(n-1)-(1/6)y(n-2)=x(n) then determine system impulse response h(n) for the system. 10M

5) Derive an expression for energy density spectrum of a Discrete-time sequence. 10M

6) Explain and prove the properties of Discrete- time Fourier Transform. 10M

7) Discuss different types of linear-phase filters with neat sketch. 10M

8) Discuss various complementary functions in digital signal processing. 10M

9) a)How to identify a system when h(n) is a known value. Discuss in detail. 6M

b) Discuss the stability triangle concept. 4M

10) Determine the DTFT of the sequences

a) $x[n]=1, \ -\infty < n < \infty.$ and b) $y[n]= \alpha^{|n|}$ for $|\alpha|<1$

11) What is stability triangle. Explain in detail. Test the stability of the system characterized by transfer function.

$$H(Z)= \frac{1}{1+z+2z^2+3z^3+4z^4}$$ 10M

UNIT-II

1) Realize the allpass filter in cascade form

$$A_3(Z)=\frac{-0.2+0.18z^{-1}+0.4z^{-2}+z^{-3}}{1+0.4z^{-1}+0.18z^{-2}-0.2z^{-3}}$$ 10M

2) Discuss in detail about various tunable IIR digital filters.

3) Realize the FIR transfer function in cascade Lattice form

$$H(Z)=1+1.2z^{-1}+1.12z^{-2}+0.12z^{-3}-0.08z^{-4}$$ 10M

4) How to design a computationally efficient FIR digital filter. Discuss various methods. 10M

5) What is power symmetric FIR filter. Realize the filter by considering one example. 10M

6) Realize the allpass filter in lattice form

$$A_3(Z)=\frac{-0.2+0.18z^{-1}+0.4z^{-2}+z^{-3}}{1+0.4z^{-1}+0.18z^{-2}-0.2z^{-3}}$$ 10M

7) Discuss Gray-Markel method of realization. Realize the transfer function

$$H(Z)=\frac{0.44z^{-1}+0.362z^{-2}+0.02z^{-3}}{1+0.4z^{-1}+0.18z^{-2}-0.2z^{-3}}$$ 10M

8) a)Design a digital sine- cosine generator. 5M

b) Briefly discuss about the computational complexity of digital filter in various methods. 5M

9) Briefly discuss various designing methods of IIR filter designing. 10M

10) Discuss various polyphase structures involved in digital filter design. 10M

UNIT-III

1. (a) Define down sampling and up sampling with suitable example. 5M

   (b) What is aliasing ? What is the need for anti- aliasing filter prior to down sampling. 5M

2. With the help of block diagram explain the sampling rate conversion by a rational factor `I/D'.Obtain necessary expressions. 10M

3. Describe the decimation process with a factor of `D '. Obtain necessary expression, sketch frequency response. Also discuss aliasing effect. 10M

4. Describe the interpolation process with a factor of `I '. Obtain necessary expression, sketch frequency response. Also discuss imaging effect. 10M

5. (a) Explain the need of multirate signal processing with suitable example. 3M

   (b) What is the imaging and aliasing ? How their spectrum differ? 3M

   (c) Can fractional sampling implemented directly? Justify your answer with suitable example. 4M

6. Explain the linear filtering approach to compute DFT using chirp-z transform with an example. 10M

7. Illustrate how a 15-point DFT can be computed using the prime-factor algorithm. 10M

8. . Illustrate how a 15-point DFT can be computed using the index mapping algorithm. 10M

9.Expalin briefly about different types of DFT computations over narrow frequency band. 10M

10.Explain briefly about the following DFT computation techniques

   a) Sliding DFT 4M

   b) Index based mapping 6M

UNIT –IV

1. Compute the energy density spectrum of a discrete time sequence. 10M

2. (a) Explain in detail how DFT is useful in computation of power density spectrum. 5M

(b) Discuss in detail the computational requirements of nonparametric methods of power spectrum estimation. 5M

3. Compare the Bartlett method of signal modeling with Weltch method of modeling. 10M

4. Derive Yule walker equation for ARMA, AR and MA models 10M

5. Derive the Bartlett method of estimating the spectrum with neat sketch. 10M

6. a) Describe the MA and ARMA models for power spectrum estimation. 5M

b) Define Autocorrelation. List the properties of Auto Correlation. 5M

7. a) Discuss about Welch method of power spectrum estimation. 5M

b) List the advantages and disadvantages of Burg method of power spectrum estimation. 5M

8. a) Derive the mean and variance of the power spectral estimate of the Blackman Tukey method. 6M

b) Determine the frequency resolution of Bartlett, Welch and Blackman-Tukey methods of power spectrum estimates for a quality factor Q=10. Assume that overlap in Welch method is 50% and length of sample sequence is 1024. 4M

9. a) What is the basic principle of parametric methods in power spectral estimation? Discuss briefly various techniques in parametric method. 5M

b) Obtain the relation between model parameters and the Auto Correlation coefficients in AR model spectral estimation. 5M

10. Determine the mean and the auto correlation of the sequence x(n) generated by the MA(2) process described by the difference equation.

$$X(n) = w(n) - 2\,w(n-1) + w(n-2)$$

Where w(n) is the white noise process with variance σ^2_w 10M

UNIT – V

1. a) What are the quantization errors in FFT algorithm? Explain them.	5M
b) Explain about the errors result that from the truncation and rounding with an example.	5M
2. Explain Discrete-time analytic signal generation with neat sketch.	10M
3. Discuss finite word length effects in FIR systems.	10M
4. Explain dual tone multi frequency signal detection with neat sketch.	10M
5. Explain in detail the nonparametric spectral analysis.	10M
6. With neat sketch explain a natural-sounding reverbator scheme in detail.	10M
7. Design a first order filter and equalizer to boost and to cut the signal accordingly.	10M
8. (a) Discuss the need for signal compression.	5M
(b) Explain the concept of dual tone multi frequency signal detection.	5M
9. Discuss the applications of digital signal processing.	10M
10. Discuss in detail about oversampling D/A converter.	10M