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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

B.Tech VI Semester End Examinations (Regular) - May, 2019

Regulation: IARE – R16

DIGITAL SIGNAL PROCESSING

Time: 3 Hours

(ECE)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- Discuss in detail the Realization structures of Digital filters . [7M]
 - Determine the convolution sum of two sequences $x(n)=\{4, 2, 1, 3\}$ and $h(n)=\{1, 2, 2, 1\}$. [7M]
- Define LTI system? Determine if the system described by the following input-output equation is LTI or not? $Y(n) = n x(n)$. [7M]
 - Obtain the Direct form-II Realization of the equation given:
 $y(n)=-0.1 y(n-1)+0.2 y(n-2)+3x(n)+3.6x(n-1)+0.6x(n-2)$ [7M]

UNIT – II

- State the properties of DFT. What is FFT? Discuss its efficiency with respect to DFT in detail. [7M]
 - Compute the IDFT using DIF FFT algorithm given that
 $X(k) = \{ 4, 1-j2.414, 0, 1-j0.410, 0, 1+j0.414, 0, 1+j2.414\}$. [7M]
- Define DTFT and compare DTFT with DFT of a sequence. [7M]
 - Compute the output for a given sequence $x(n)=1,2,3,4$ using Radix-2 FFT algorithm. [7M]

UNIT – III

- Discuss in detail the transformation of analog filters into equivalent digital filters using Bilinear transformation technique [7M]
 - Design a 4th order band-pass IIR digital filter with lower & upper cut-off frequencies at 300 Hz & 3400 Hz when $f_s = 8$ kHz. [7M]
- Write a MATLAB program to design a Chebyshev Type-1 IIR low pass filter using Impulse invariant transformation technique.(Assume the desired specifications) [7M]
 - Apply bilinear transformation to $H(s)=2/(s+1)(s+2)$ with T is 1 sec, find $H(z)$. [7M]

UNIT – IV

7. (a) Write a MATLAB Program to design FIR low pass filter using Rectangular Windowing Technique (Assume the input parameters) [7M]
- (b) Design an ideal Hilbert transformer having frequency response $H(e^{j\omega}) = j - \pi \leq \omega \leq 0 - j0 \leq \omega \leq \pi$ for $N=11$ using rectangular window. [7M]
8. (a) Compare and contrast FIR and IIR Filters. With suitable examples. [7M]
- (b) Define the terms i) Linear Phase FIR ii) Windowing Technique iii) Least- Mean-Square Error [7M]

UNIT – V

9. (a) Write a short note on i) Decimation and interpolation ii) Truncation and rounding [7M]
- (b) Expose the applications of multirate signal processing for the design of phase shifters [7M]
10. (a) With a neat sketch illustrate the sampling rate conversion by a rational factor I/D. [7M]
- (b) The output of an A/D is fed through a digital system whose system function is $H(z)=1/(1-0.8z^{-1})$. Find the output noise power of the digital system. [7M]

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