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Question Paper Code : 80375

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fourth Semester

Electrical and Electronics Engineering

EE 6403 — DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING

(Common to Instrumentation and Control Engineering, Electronics and Instrumentation Engineering)

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between discrete signal and digital signal representations.

2. If $x(n) = x(n+1)+x(n-2)$, is the system causal?

3. Find the system transfer function $H(Z)$ if $Y(n)=x(n)+y(n-1)$.

4. Explain the relationship between s-plane and z-plane.

5. Why is it required to do Zero padding in DFT analysis?

6. What is need for windowing techniques on Fourier Transformed signals?

7. Why are digital filters more useful than analog filters?

8. Name one method that convert the transfer function of a analog into the digital filter.

9. What is Gibbs Phenomena?

10. State how spectrum meter application can be designed with DS Processor.

PART B — (5 × 16 = 80 marks)

11. (a) With neat figure explain block diagram of a Digital Signal processing system. State the advantages of convolution technique. (14+2)

Or

(b) Distinguish the following with examples and formulae.

(i) energy vs power signal

(ii) time variant vs time invariant signal.

12. (a) (i) Explain the role of windowing to realize a FIR filter.

(ii) Compare and explain on the choice and type of windows selection for signal analysis.

(iii) Compute numerically the effect of Hamming windows and design the filter if

Cut-off frequency = 100 Hz.

Sampling frequency = 1000 Hz.

Order of filter = 2

Filter length required = 5. (6+6+4)

Or

(b) Evaluate the following :

(i) The impulse response $h(n)$ for $y(n)=x(n)+2x(n-1)-4x(n-2)+x(n-3)$

(ii) The ROC of a finite duration signal $x(n)=\{2,-1,-2,-3,0,-1\}$

(iii) Inverse Z-Transform for $X(z)=1/(z-1.5;)^4$; ROC : $|z|>1/4$.

13. (a) What is the need for frequency response analysis? Determine the frequency response and plot the magnitude response and phase response for the system.

$y(n)=2x(n)+x(n-1)+1y(n-2)$. (6+10)

Or

(b) Describe the need for Bit reversal and the Butterfly structure. For a sequence $x(n)=\{4,3,2,1,-1.2,3,4\}$ obtain the 8pt FFT computation using DIT method. (4+12)

14. (a) Write briefly on any TWO of the following : (8+8)

(i) Comparison of Butterworth and Chebyshev Filter

(ii) Elaborate one application of digital signal processing with a DS processor.

(iii) A difference equation describing a filter is given by $y(n)-2y(n-1)+y(n+2)=x(n)+\frac{1}{2}x(n-1)$ obtain direct form II structure.

Or

(b) Obtain the system function of the digital filter if the analog filter is $H_a(s)=1/\left[(s+0.2)^2+2\right]$. Using the impulse invariance method and the Bilinear Transformation method obtain the digital filter. (8+8)

15. (a) Compute the following if : $x_1=[-1,-1,-1,2]; x_2=[-2,-1,-1,-2]$ (10+6)

(i) Linear and circular convolution of a sequence

(ii) $x_1 ; x_2$ subject to addition and multiplication.

Or

(b) Write briefly an any 'TWO' of the following : (8+8)

(i) Quantisation and errors in DS processor

(ii) With neat figure explain the architecture of any one type of a DS processor.

(iii) The addressing modes of one type of DS Processor.