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Question Paper Code : 50483

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2017

Fourth Semester

Electrical and Electronics Engineering

EE 6403 – DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING

**(Common to : Electronics and Instrumentation Engineering, Instrumentation and Control Engineering)
(Regulations 2013)**

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. State the Parseval's theorem for discrete time signal.
2. What is meant by aliasing effect ?
3. List the methods to find inverse Z transform.
4. Write the conditions to define stability in ROC.
5. Find the DFT of the signal $x(n) = a^n$.
6. Draw the butterfly structure for 2 point DFT using DIT – FFT algorithm.
7. Draw the direct form I structure for 3rd order system.
8. What is prewarping effect ?
9. Write the features of DSP processor.
10. List some example of commercial digital signal processor.



PART - B

(5×13=65 Marks)

11. a) i) Determine the power and energy of the given signal. State the signal is power or energy $x(n) = \sin\left(\frac{\pi n}{4}\right)$. (4)
- ii) Determine the given signal is periodic or not $x(n) = \cos\left(\frac{2\pi n}{3}\right)$. (3)
- iii) Discuss the mathematical representation of signal. Write the difference between continuous and discrete time signal. (6)
- (OR)
- b) i) Determine whether the system is linear or not $y(n) = ax(n) + bx(n-1)$. (3)
- ii) Determine whether the given system is causal or not $y(n) = x(n) + x^2(n-1)$. (4)
- iii) Determine whether the system is time invariant and stability: $y(n) = e^{x(n)}$. (6)
12. a) i) State and prove any three properties of Z transform. (8)
- ii) Find the Z transform of $x(n) = r^n \cos(n\theta) u(n)$. (5)
- (OR)
- b) i) A discrete system has a unit sample response $h(n) = \frac{1}{2}\delta(n) + \delta(n-1) + \frac{1}{2}\delta(n-2)$. Find the system frequency response. (7)
- ii) Find the convolution of the two sequences $x(n) = \{1, 2, -1, 1\}$ and $h(n) = \{1, 0, 1, 1\}$ using graphical method. (6)
13. a) i) State and prove any two properties of DFT. (6)
- ii) Determine the DFT of the following sequence $x(n) = \{5, -1, 1, -1, 2\}$. (7)
- (OR)
- b) Find the DFT of a sequence $x(n) = \{1, 2, 3, 4, 4, 3, 2, 1\}$ using DIT - FFT algorithm. (13)
14. a) Obtain an analog Chebyshev filter transfer function that satisfies the given constraints $\frac{1}{\sqrt{2}} \leq |H(j\Omega)| \leq 1; 0 \leq \Omega \leq 2$
 $|H(j\Omega)| < 0.1; \Omega \geq 4$ (13)
- (OR)



- b) Design an ideal lowpass FIR filter with a frequency response.

$$H_d(e^{j\omega}) = 1 \text{ for } -\frac{\pi}{2} \leq \omega \leq \frac{\pi}{2}$$

$$= 0 \text{ for } \frac{\pi}{2} \leq \omega \leq \pi$$

Find the values of $h(n)$ for $N = 11$. Find $H(z)$. Assume rectangular window. (13)

15. a) Draw the architecture of TMS320C50 and explain its functional units. (13)
- (OR)
- b) Explain the classification of instructions in DSP processor with suitable examples. (13)

PART - C

(1×15=15 Marks)

16. a) Design Butterworth filter using the impulse invariance method for the following specifications:
- $$0.8 \leq |H(e^{j\omega})| \leq 1, 0 \leq \omega \leq 0.2\pi$$
- $$|H(e^{j\omega})| \leq 0.2, 0.6\pi \leq \omega \leq \pi$$
- Realize the designed filter using direct form II structure. (15)
- (OR)
- b) i) How mapping from S-domain to Z-domain is achieved in bilinear transformation. (8)
- ii) Apply Bilinear transformation to $H(S) = \frac{2}{(S+1)(S+2)}$. (7)