A 1225

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Sixth Semester

Mechatronics Engineering

EE 351 — DIGITAL SIGNAL PROCESSING

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write down the expression for a discrete step function delayed by two units.

2. What are the steps involved in converting analog signal into digital signal?

3. Define even sequence.

4. What is the Z – transform of $x(-n)$ and $a^n x(n)$.

5. What is the difference between Fourier series and Fourier Transform?

6. Define DFT and IDFT.

7. State sampling theorem.

8. Define 'Low pass filter' with an example.

9. What is the transfer function of a second order IIR filter?

10. Name any four window functions.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the first six sampled values of a signal $x(t) = \cos 2\pi 50t$ sampled at a rate of 150 samples / sec.   (6)

       (ii) Explain any two applications of signal processing.   (10)

Or

(b)   (i)   Give the advantages of digital signal processing over analog signal processing.   (4)

       (ii)   Give the various kinds of classification of signals with an example for each of those classes.   (12)

12. (a)   (i)   Define linear, time-invariant, stable and causal system.   (8)

       (ii)   Draw the frequency response of the system given by $H(z) = \left(Z - \dfrac{1}{a}\right) \Big/ (Z - a)$.   (8)

Or

(b)   (i)   State and prove any four properties of Z – transform.   (8)

       (ii)   Find the Z – transform of $\left(\dfrac{1}{2}\right)^n u(n) + \left(\dfrac{1}{3}\right)^n u(n)$ with its ROC.   (8)

13. (a)   (i)   Find the DFT of $x(n) = \{1, 1, 1, 1\}$.   (8)

       (ii)   Draw the flow graph of 4 point DIT – FFT.   (8)

Or

(b)   (i)   Find the circular convolution of $\{1, 1, 2, 1\}$ with $\{1, 2, 3, 4\}$.   (8)

       (ii)   Derive the flow graph of DIF – FFT.   (8)

14. (a)   (i)   Draw the sample and Hold circuit? Explain its working.

       (ii)   Explain how do you recover the original continuous signal from sampled signal.

Or

(b)   (i)   Draw the successive approximation AD converter circuit and explain.   (10)

       (ii)   What is aliasing? When does it occur? How is the effect of aliasing minimised?   (6)

15. (a) (i) How do you convert analog transfer function into digital transfer function? Explain any two methods with merits and demerits. (8)

(ii) Explain the design of FIR filter using window technique. (8)

Or

(b) (i) Draw the architecture of TMS processor and explain its important features. (10)

(ii) Draw the direct form – II structure of IIR system for second order system. (6)

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