5E5107

Total No of Pages: 3

5E5107

B. Tech. V Sem. (Main/Back) Exam., Nov.-Dec.-2016
Computer Science & Engineering
5CS6.2A Digital Signal Processing
Common With CS, IT

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks Main: 26
Min. Passing Marks Back: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*

Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL

2. NIL

UNIT – I

Q.1 (a) Check whether the following systems are linear - [8]

(i) $F[x(n)] = an\ x(n) + b$

(ii) $F[x(n)] = e^{x(n)}$

(b) Check whether the following systems are linear & time invariant - [8]

(i) $F[x(n)] = n[x(n)]^2$

(ii) $F[x(n)] = a[x(n)]^2 + 3(x(n))$

OR

Q.1 (a) List out the properties of LTI system. Explain each with the help of an example. [8]

(b) A second order discrete time system is characterized by the difference equation. [8]

$y(n) - 0.1y(n-1) - 0.02y(n-2) = 2x(n) - x(n-1)$

Determine $y(n)$ for $n \geq 0$ when $x(n) = 4(n)$ &

The initial conditions are $y(-1) = -10$ &

$y(-2) = 5$

UNIT – II

Q.2 Find out the linear convolution of an FIR filter with impulse response $h(n) = \{1, 2, 4\}$ to the input sequence $x(n) = \{1, 2\}$

(Use process of circular convolution with padding of Zeros.) [16]

OR

Q.2 (a) Define ROC for Z transform. Write down its properties for Z transform. [6]

(b) Determine the inverse Z transform of the following x(z) by the partial fraction expansion method. [10]

$$\left[x(z) = \frac{z+2}{2z^2 - 7z + 3} \right]$$

If the ROCs are

(a) $|z| > 3$

(b) $|z| < \frac{1}{2}$

(c) $\frac{1}{2} < |z| < 3$

UNIT – III

Q.3 Define sampling theorem. Explain Interpolation technique for the reconstruction of a signal from its samples. [16]

OR

Q.3 (a) What do you mean by aliasing. [6]

(b) A Continuous signal is given as $x_e(t) = \sin(2\pi(100)t)$

This signal was sampled with sampling period T = 1/400 second to obtain discrete time signal x(n). Determine the resulting signal x(n). [10]

UNIT – IV

Q.4 (a) Find the DFT of the sequence: [10]

$$x(n) = \begin{cases} 1; 2 \le n \le 6 \\ 0; n = 0, 1, 7, 8, 9 \end{cases}$$

Given N = 10

(b) Explain Parseval's theorem & circular shift property for DFT. [6]

OR

Q.4 (a) Explain Decimation in frequency FFT (DIF-FFT) algorithm; with diagram. [8]

(b) Determine the four point DFT for x(n) = {0, 1, 2, 3} using DIT – FFT algorithm. [8]

UNIT – V

Q.5 Write shot note on - [4×4=16]

(a) Structures of FIR filter

(b) Cascade & parallel structure

(c) Hamming window

(d) Chebyshev filter

OR

Q.5 The following specifications are given to design a band pass filter – [16]

Stop band frequencies = 0.1π rad/sec,

0.7π rad/sec.

Pass band lower cutoff frequency = 0.25π rad/sec

Pass band upper cutoff frequency = 0.35π rad/sec

Pass band attenuation = - 3dB.

Stop band attenuation = - 15dB

Sampling rate = 1 sample/sec.

Design a Band pass filter using bilinear transformation.
