7E7072

Roll No. _____ Total No of Pages 3

7E7072

B. Tech. VII Sem. (Main/Back) Exam, Nov– Dec. 2017
Applied Electronics Instrumentation & Engineering
7AI2A Digital Signal Processing
AI, EC, EIC

Time: 3 Hours **Maximum Marks: 80**
Min. Passing Marks: 26

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) State Shannon's sampling theorem. Explain sampling with zero order hold and reconstruction of signals. [8]

(b) The signal $x_c(t) = \sin [2\pi(100)t]$ was sampled with sampling period T = 1/400 second to obtain a discrete time signal x[n]. What is the resulting signal x[n]. [8]

OR

Q.1 (a) Define Aliasing with suitable waveform. Explain its effect and how it can be prevented. [8]

(b) Let x(t) be a band limited signal such that $X(jw) = 0$ for $|w| \geq \pi/T$ [8]

If x(t) is sampled using a sampling period T, determine an interpolating function g(t) such that

$$\frac{dx(t)}{dt} = \sum_{n=-\infty}^{\infty} x(nT) \quad g(t - nT)$$

UNIT-II

Q.2 (a) Discuss Minimum phase system with example. [8]

(b) Check whether the following systems are linear: [8]

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

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

OR

Q.2 (a) Explain the condition for an LTI discrete time system to be causal. [6]

(b) Check whether the discrete time system represented by following equations are Linear and causal – [5×2=10]

(i) $y(n) = 3y^2(n-1) - n\,x(n) + 4x(n-1) - 2x(n+1)$

(ii) $y(n) = x(n+1) - 3x(n) + x(n-1)\ ;\ n \geq 0$

UNIT-III

Q.3 (a) Determine the direct form I and II realizations for a IIIrd Order IIR transfer function. [8]

$$H(z) = \frac{0.28z^2 + 0.319z + 0.04}{0.5z^3 + 0.3z^2 + 0.17z - 0.2}$$

(b) Explain cascade and parallel realization of IIR systems with example. [8]

OR

Q.3 Draw the structures of cascade & parallel realization of [16]

$$H(z) = \frac{(1 - z^{-1})^3}{(1 - \frac{1}{2}z^{-1})(1 - \frac{1}{8}z^{-1})}$$

UNIT-IV

Q.4 (a) Apply bilinear transformation to [8]

$$H(s) = \frac{2}{(s+1)(s+3)}$$

With T = 0.1s.

(b) Describe Chebyshev filters with its response. [8]

OR

Q.4 (a) Convert the analog filter into a digital filter whose system function is [8]

$$H(s) = \frac{s+0.2}{(s+0.2)^2+9}$$

Use the impulse invariant technique. Assume T = 1s.

(b) Discuss FIR filters by windowing technique. Give the filter response of all window functions. [8]

UNIT-V

Q.5 (a) List out the properties of Discrete Fourier Transform (DFT). [8]

(b) Find the N point DFT for $x(n) = a^n$ for $0<a<1$ [8]

OR

Q.5 (a) Find the inverse DFT of X(k) = {1, 2, 3, 4} [10]

(b) Explain DIT (Decimation – In – time) algorithm. [6]
