SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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Redesigning Common Mind & Business Towards Excellence

Build an Entrepreneurial Mindset Through Our Design Thinking FrameWork

B.E. – Electronics and Communication Engineering

23ECT201 & Signals and Systems

UNIT V - LINEAR TIME INVARIANT –DISCRETE TIME SYSTEMS

QUESTION BANK

PART - B

1. Find the state variable matrices A, B, C and D for the input-output relation given by
$y(n) = 6y(n-1) + 4y(n-2) + x(n) + 10(n-1) + 12(n-2)$ (8) (Apr/May 2012)

(or)

Write a brief note on state variable representation of a system. (8) (Apr/May 2011)

(or)

Describe the state variable model for discrete time systems. (8) (Apr/May 2010)

(or)

Find the state variable matrices A, B, C and D for
$y(n) - 3y(n-1) - 2y(n-2) + x(n) + 5x(n-1) + 6x(n-2)$ (8) (Apr/May 2010)

2. Draw Direct Form I and Direct Form II implementations of the system described by the differenceEquation $y(n) + 0.25\, y(n-1) + 0.125\, y(n-2) = x(n) + x(n - 1)$ (6) (Nov/Dec 2013)

(or)

Draw the direct form, cascade form and parallel form block diagrams of

$$H(z) = \frac{1}{(1+0.5z^{-1})(1-0.25z^{-1})}$$

(10) (Nov/Dec2012)

(or)

Realize the following system in cascade form

$$H(z) = \frac{1+\frac{1}{5}z^{-1}}{\left(1-\frac{1}{2}z^{-1}+\frac{1}{3}z^{-2}\right)\left(1+\frac{1}{4}z^{-1}\right)}$$

(10) (Apr/May2016)

(or)

Draw the direct form II block diagram for

$H(z) = (1 + 2 z^{+1} - 20z^{+2} - 20z\text{-}^{2} - 5z^{-4}+ 6z^{-6}) / (1 + 0.5z^{-1}-0.25z^{-2})$ (8) (Apr/May 2012)

(or)

Obtain the parallel realization of the system $y(n) - 3\, y(n-10 + 2y(n-2) = x(n)$ (8) (Apr/May 2011)

(or)

Obtain Direct Form I, Direct Form II, cascade and parallel form realization of the system described by the difference equation
$y(n) = 0.75\, y(n-1) - 0.125\, y(n-2) + x(n) + 0.5\, x(n - 1) - x(n-2)$ (16) (Nov/Dec 2010)

(or)

Determine direct form II and transpose form structure for the system given by the difference equation $y(n) = 0.5\, y(n-1) - 0.25\, y(n-2) + x(n) + x(n - 1)$ (12) (Nov/Dec 2010)

(or)

Discuss the block diagram representation for LTI discrete time systems. (8) (Apr/May 2010)

(or)

Obtain cascade and parallel form realization of the system

$$y(n) - 0.25\ y(n-1) - 0.125\ y(n-2) = x(n) + 3\ x(n-1) + 2x(n-2)$$ (16) (Nov/Dec 2009)

3.Compute Convolution Sum of the following sequences $x(n) = \begin{cases} 1, 0 \le n \le 4 \\ 0, \text{otherwise} \end{cases}$ and

(10) (Nov/Dec 2013)

(or)

Find the convolution sum between x(n)={1,4,3,2}and h(n)={1,3,2,1} (6) (Apr/May2015)

4.Determine transfer function and impulse response for causal LTI system

$y(n) - 0.25\, y(n-1) - (3/8)\, y(n-2) = -x(n) + 2x(n-1)$ using Z Transform. (8) (Nov/Dec 2013)

(or)

A LTI system is characterized by the system $H(z) = \dfrac{3 - 4z^{-1}}{1 - 3.5z^{-1} + 1.5z^{-2}}$ Specify the ROC of H(z) and determine h(n) for the following conditions:

(a) The System is stable
(b) The system is causal
(c) The system is anti-causal (10) (Nov/Dec 2012)

(or)

Find the input x(n) which produces output y(n) = {3, 8, 14, 8, 3} when passed through the system h(n) = {1, 2, 3} (8) (Apr/May 2012)

(or)

An LTI system is given with impulse response $h(n) = (0.5)^n U(n)$. Determine

(a) Whether the system is causal or not (3) (Apr/May 2011)
(b) Whether the system is stable or not (3) (Apr/May 2011)
(c) Response for input x(n) = U(n) (10) (Apr/May 2011)

5 Compute $y(n)=x(n)*h(n)$ Where $x(n)=(1/2)^{-n} u(n-2)$;$h(n)=u(n-2)$ (16) (Nov/Dec 2014)

(or)

Convolve the following signals:

$$x[n] = \left(\frac{1}{2}\right)^{n-2} u[n-2]$$

$$h[n] = u[n+2]$$

(16) (Nov/Dec 2015)

(or)

Convolve

$$x(n) = \{1, 1, \underset{\uparrow}{0}, 1, 1\} \qquad h(n) = \{1, -2, -3, \underset{\uparrow}{4}\}$$

(6) (Apr/May2016)

(or)

Consider an LTI system with impulse response $h(n)=\alpha^n u(n)$ and the input to this system is $x(n)=\beta^n u(n)$ with $|\alpha| \& |\beta|$

(i). when α=β
(ii). when α≠β using DTFT. (16) (Nov/Dec 2015)

6. Obtain the impulse response of the system given by the difference equation

$$y(n) - \frac{5}{\_}y(n-1) + \frac{1}{\_}y(n-2) = x(n)$$ (10) (Apr/May 2013)

6 6

(or)

Determine the range of values of the parameter "a" for which the LTI system with impulse response $h(n) = a^n u(n)$ is stable. (6) (Apr/May 2013)

(or)

Compute the response of the system y(n) = 0.7 y(n–1) - 0.12 y(n-2) + x(n-1)+x(n-2) to the input x(n) = n u(n). Is the system stable? (or) (16) (Apr/May2013)

Find the system function and impulse response h(n) for a system described by the following input-output relationship y(n) = 0.3 y(n-1)+ 3x(n) (6) (Nov/Dec 2012)

(or)

Derive the necessary and sufficient condition for BIBO stability of an LSI system. (6) (Nov/Dec 2012)

Find the impulse response of y(n) – 2y(n-2) + y(n-1) + 3y(n-3) = x(n) + 2 x(n-1) (8) (Apr/May 2012)

(or)

A causal system has input x(n) and output y(n). Determine the impulse response of the system x(n) = δ(n) + 0.25 δ(n-1) – 0.125 δ(n-2) and y(n) = δ(n) - 0.75 δ(n-1) (6) (Nov/Dec 2010)

(or)

A causal system has x(n) = δ(n) + 1/4 δ(n-1) – 1/8 δ(n-2) and y(n) = δ(n) – 3/4 δ(n-1). Find the impulse response and output if $x(n)=(1/2)^n$ u(n). (12) (Apr/May2015)

(or)

Find the output y(n) of a LTI system y(n) + 2y(n-1) – y(n-2) = x(n) + 3 x(n-1) and input $x(n) = (0.25)^n$ u(n). Assume the initial conditions are y(-1) = 0 and y(-2) = 1. (10) (Nov/Dec 2010)

(or)

Describe the finite and infinite impulse response system. (4) (Nov/Dec 2010)

(or)

Find the impulse response of y(n-2) -3y(n-1) + 2y(n) = x(n-1) (8) (Apr/May 2010)

(or)

Find impulse and step response of the system y(n) – 0.75 y(n-1)+0.125y(n-2) = x(n) (16) (Nov/Dec 2009)

(or)

Determine the impulse and step response of the system y(n) + y(n-1)-2y(n-2) = x(n-1)+2x(n-2) (10) (Apr/May2015)

(or)

LTI discrete time system y(n)=3/2 y(n-1)-1/2 y(n-2)+x(n)+x(n-1) is given an input x(n)=u(n)

(i) Find the transfer function of the system.
(ii) Find the impulse response of the system. (16) (Nov/Dec2014)

(or)

A system is governed by a linear constant coefficient difference equation y(n)=0.7 y(n-1)-0.1 y(n-2)+2 x(n)-x(n-2).Find the output response of the system y(n) for an input x(n)=u(n). (16) (Apr/May2016)