(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 2290009 Roll No.

B.TECH.

Regular Theory Examination (Odd Sem - III) 2016-17

BASIC SYSTEM ANALYSIS

Time : 3 Hours *Max. Marks : 100*

Note: Attempt all Sections. If require any missing data; then choose suitably.

Section - A

1. Attempt all questions in brief. (10×2=20)

a) Explain different type of signal.

b) Distinguish between energy and Power signals.

c) What is region of convergence?

d) Explain static and dynamic systems.

e) Differentiate between Fourier series and Fourier transform.

f) State the initial and final value theorem for Z-transform.

g) Differentiate the force voltage analogy and force current analogy.

h) Explain state transition matrix.

i) Prove the frequency shifting property of Fourier transform.

j) What do you mean by characteristic equation of a system.

Section - B

2. Attempt any three of the following (3×10=30)

a) Prove the periodicity property and convolution property of DTFT.

b) Find the inverse Z-transform of the following function:

$X(z)=1/(1+z^{-1})^2(1-z^{-1})$ ROC: $z > 1$

c) A system has impulse response $h(t)=e^{-2t}u(t)$. Find its system function and the output if the input to the system is $x(t) = e^{-t}u(t)$

d) Derive the state equation of a system having transfer function as follows:

$Y(s)/U(s) = 8/s(s+2)(s+3)$ use.

i) Cascade and

ii) Parallel decomposition.

e) Find the Z-transform of the signal $x(n) = n2^n u(n)$. Also find the ROC.

Section - C

3. Attempt any one part of the following. (1×10 =10)

a) Calculate the Laplace transform for the function

$F(t) = e^{-at}\sinh bt$

b) An LTI system represented by the following difference equation

$3y(n) = 5y(n-1) - 7y(n-2) + 4x(n-1)$ for $n \geq 0$, determine

i) Impulse response h(n)

ii) Obtain cascade and parallel form realization for discrete time system.

4. Attempt any one part of the following: (1×10 =10)

a) Determine the inverse Z-transform of the following functions:

i) $X(z)=(Z-1)/(Z^2-4Z+4)$

ii) $X(Z)=Z^2/(Z^2-5/4Z+3/8)$

b) Find the convolution of sequences.

$X_1(n) = (1/4)^n u(n)$ & $X_2(n)=(1/5)^{n-2}u(n-2)$ using:

i) Convolution in Z.T.

ii) Time Domain Method.

5. Attempt any one part of the following. (1×10 =10)

a) For the discrete system described by the difference equation y(n) = 0. 6y(n-1)-0.08y(n-2)+x(n).

Determine:

i) The unit sample response sequence, h(n),

ii) The step response.

b) Find inverse z transform $X(z) = \ln(1/(1-a^{-1}z))$

6. Attempt any one part of the following. (1×10 =10)

a) Using Laplace transform solve the following differential equation.

$d^2y(t)/dt^2 + 5dy(t)/dt + 4y(t) = x(t)$, if

$x(t) = e^{-2t}u(t)$ & $y(0^-) = -2$, $dy(0^-)/dt = -1$, and find auto correlation of sequence x(n) = (-1,1,-1).

b) Derive and sketch frequency response of second order continuous time system.

7. Attempt any one part of the following. (1×10 =10)

a) Find the impulse response & step response of the following System.

$H(s) = 5/(s^2+5s+6)$

b) Find the Laplace Transform of the following signals.

i) $x(t) = te^{-t}u(t)$

ii) $x(t)=te^{-2t}\sin 2t\ u(t)$

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