

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

Paper ID : 2290009

Roll No.

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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:

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

- 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:

$$Y(s)/U(s) = 8/s(s+2)(s+3) \text{ use.}$$

- 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

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

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.

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

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.

$$d^2y(t)/dt^2 + 5dy(t)/dt + 4y(t) = x(t), \quad \text{if}$$

$x(t) = e^{-2t}u(t)$ & $y(0^-) = -2$, $dy(0^-)/dt = -1$, 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) $x(t) = te^{-2t}\sin 2t u(t)$