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NEE-303/EE-302/EEE-301

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

Paper ID : 22900009

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)**

- Explain different type of signal.
- Distinguish between energy and Power signals.
- What is region of convergence?
- Explain static and dynamic systems.
- Differentiate between Fourier series and Fourier transform.
- State the initial and final value theorem for Z-transform.
- Differentiate the force voltage analogy and force current analogy.

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- 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  $x(n) = n^2u(n)$ . Also find the ROC.

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**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.

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## 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.

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

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

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