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B. Tech. 4th Semester (EE)
Examination – July, 2021
SIGNALS AND SYSTEMS
Paper : PCC-EE-214-G

Time : Three hours]   [Maximum Marks : 75

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each unit (I, II, III & IV). Question Number 1 is *compulsory*. All question carry equal marks.

1. (a) Define Delta function.   2.5

   (b) What is meant by convolution property in DTFT ?
                                                                   2.5

   (c) State the properties of Fourier Transform of a discrete-time aperiodic sequence.   2.5

   (d) Write the limitations of Fourier Transform.   2.5

   (e) State the methods to find inverse Z-transform. 2.5

   (f) What is meant by bilateral Laplace Transform ?
                                                                   2.5

UNIT – I

2. Give the mathematical expression and graphical representation of the following continuous-time and discrete-time signal :

15

(i) Unit Step

(ii) Unit impulse

(iii) Exponential signal

(iv) Signum function

(v) D.C. signal

3. (a) Explain Energy and Power signal with the help of example.

8

(b) Determine whether the given signal is energy signal or power signal and calculate their energy or Power.

7

$$x(t) = rect(t/T_0) \cos \omega_0 t$$

UNIT – II

4. (a) What is inverse Fourier transform ? Find the inverse Fourier transform of $\delta(\omega)$. Also draw spectrum.

7

(b) State and prove Parseval's theorem for Energy signal of CTFT.

8

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5. (a) State and prove Frequency-shifting property of DTFT.

8

(b) State and explain Sampling theorem.

7

UNIT – III

6. (a) Explain the frequency response of linear-time invariant system.

7

(b) Explain the time-domain and frequency-domain aspects of non-ideal filters.

8

7. Explain and evaluate second order continuous-time LTI system.

15

UNIT – IV

8. (a) A damped sine wave is given by :

7

$$f(t) = e^{-at} \cos \omega t$$

Find 'Laplace Transform of this signal.

(b) Drive Initial value and Final value theorem.

8

9. (a) Determine the Z-transform of the discrete-time signal. Also find the ROC.

7

$$x(n) = 2^n u(n) + 3(1/2)^n u(n)$$

(b) Define Region of convergence of Z-transform and explain its properties.

8

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B.Tech. (EE) 4th Semester (G-Scheme)

Examination, July–2022

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Time allowed : 3 hours]   [Maximum marks : 75

Note: *Attempt five questions in all, selecting **one** question from each Unit (I, II, III, & IV). **Question no. 1 is compulsory.** All questions carry equal marks.*

1. (a) Define Unit Ramp function.   2.5

   (b) What is meant by duality in DTFT?   2.5

   (c) What are the conditions for the existence of Fourier Transform?   2.5

   (d) Define Filter. What are the types of Filter? 2.5

   (e) Define Region Of Convergence (ROC).   2.5

   (f) What is meant by unilateral Laplace Transform?   2.5

Unit-I

2. Define signal. Explain in detail the classification of signals with examples.   15

3. (a) Explain the following operations for independent variable of a signal:

(i) Time shifting

(ii) Time scaling

(iii) Time reversal   8

(b) Determine whether the given signal is energy signal or power signal and calculate their energy or Power.

$x(t) = \cos^2 \omega_0 t$ 7

Unit-II

4. (a) What is Fourier transform? Find the Fourier transform of an impulse function. Also draw spectrum.

$x(t) = \delta(t)$ 7

(b) What is Convolution? Explain time-convolution and frequency-convolution theorems of CTFT.   8

5. (a) State and prove time-shifting property of DTFT.   8

(b) Explain the difference between CTFT and DTFT.   7

Unit-III

6. (a) Explain the magnitude-phase representation of the frequency response of linear-time invariant System.   7

(b) Explain the time-domain properties of ideal frequency selective filters.   8

7. Explain in detail block diagram representation for Discrete-time LTI system.   15

Unit - IV

8. (a) A damped sine wave is given by

$f(t) = e^{-at} \operatorname{Sin} \omega t$

Find Laplace Transform of this signal.   7

(b) Write short notes on:

(i) Condition of existence: convergence of Laplace Transform.

(ii) Relationship between Laplace and Fourier Transform.   8

9. (a) Using partial fraction method, determine inverse Z-transform of following system given by

$$X(Z) = \frac{z(z^2 - 4z + 5)}{(z-1)(z-2)(z-3)}$$

For ROC being $|z|>3$, $2<|z|<3$, $|z|<2$.   8

(b) Find the Z-transform of discrete-time unit impulse $\delta[n]$.   7