R13

Code No: 113AW

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November - 2015

SIGNALS AND SYSTEMS

(Common to ECE, EIE, BME, ETM)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART- A (25 Marks)

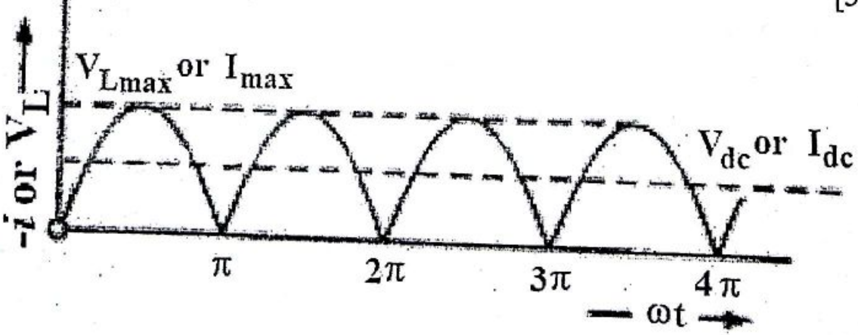
1.a) What is orthogonal signal space? [2M]
b) What are Dirichlet's conditions? State them. [3M]
c) What is anti-aliasing filter? [2M]
d) Define Hilbert transform of a signal. [3M]
e) What is signal bandwidth? [2M]
f) Write the properties of the LTI systems. [3M]
g) Define spectral density. [2M]
h) When the convolution and correlation equivalent? [3M]
i) What is steady state response? [2M]
j) What is the condition for Z – transform exist? [3M]

PART-B (50 Marks)

2.a) Explain orthogonality property between two complex functions $x_1(t)$ and $x_2(t)$ for a real variable *t*.
b) State the properties of the Fourier series. [5+5]

OR

3.a) Prove sinusoidal functions are orthogonal functions.
b) Find the exponential Fourier series for the full wave rectified sine wave function given in figure. [5+5]



4.a) State and prove the time shifting and frequency shifting properties of Fourier transform.

b) Explain about effects of under sampling. [5+5]

OR

5.a) Find Fourier transform of $e^{-2|t|}\sin(t)$.

b) Give a continuous-time signal $x(t)$ with Nyquist rate ω_N. Determine the Nyquist rate for the following continuous-time signals:

i) $y(t) = x^2(t)$.

ii) $y(t) = x(t)\cos\omega_0 t$. [5+5]

6.a) The impulse response of a continuous-time system is expressed as:

$h(t) = e^{-2t}u(t)$

Find the frequency response of the system. Plot the frequency response.

b) Explain ideal filters. [5+5]

OR

7.a) What is an LTI system? Derive an expression for the transfer function of an LTI system.

b) Let the system function of an LTI system be $1/(j\omega + 3)$. What is the output of the system y(t) for an input $(0.5)^t u(t)$? [5+5]

8.a) Bring out the relation between Correlation and Convolution.

b) Explain the properties of Correlation function. [5+5]

OR

9. Obtain the convolution of the following two functions:

$$x(t) = \begin{cases} 1 & \text{for } -3 \le t \le 3 \\ 0 & \text{otherwise.} \end{cases}$$

$$h(t) = \begin{cases} 2 & \text{for } 0 \le t \le 3 \\ 0 & \text{otherwise} \end{cases}$$

[10]

10. Prove that the signals $x(t) = e^{-at}u(t)$ and $x(t) = e^{-at}u(-t)$ have the same X(*s*) and differ only in ROC. [10]

OR

11.a) Find the Laplace transform of $x(t) = \dfrac{5s+4}{s^2+2s+1}$ Re(s) < -1.

b) State and prove integration and differentiation properties of Z – transform. [5+5]

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Code No: 123AW **R15**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, November/December - 2016
SIGNALS AND SYSTEMS
(Common to ECE, EIE, ETM)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
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PART- A

(25 Marks)

1.a) Define even and odd components of the signal how do you get it. [2]
b) Sketch the unit step function and signum function bring the relation between them.[3]
c) Distinguish between Series and Transform in the Fourier representation of a signal.[2]
d) Define and write the conditions of sampling theorem. [3]
e) Characterize a Linear Time Invariant (LTI) System. [2]
f) Express and derive the Relationship between Bandwidth and Rise time. [3]
g) Write the Convolution property of Fourier Transform. [2]
h) Distinguish between Cross Correlation and Auto Correlation. [3]
i) Write the Fundamental difference between Continuous and Discrete time signals. [2]
j) Find the Z transform of x[n] = u[-n]. [3]

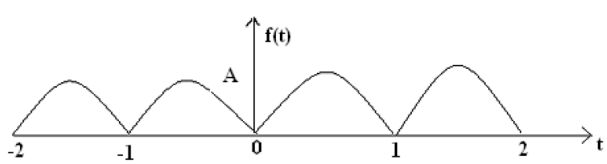
PART-B

(50 Marks)

2.a) Explain orthogonality property between two complex functions $f_1(t)$ and $f_2(t)$ for a real variable t.
b) Define and derive the expression for evaluating mean square errors and its types. [5+5]

OR

3. Find the Exponential Fourier series for the rectified Sine wave as shown in figure. [10]



4. Obtain the Fourier transform of the following functions:
a) Impulse Signal
b) Single symmetrical Gate Pulse. [5+5]

OR

5.a) Write about the types of Sampling and compare the Impulse Sampling, Natural and Flat top Sampling methods.
b) Describe about the Hilbert Transform and express its properties. [5+5]

6. Explain the difference between the following systems with examples.
   a) Linear and Non-linear systems.
   b) Causal and Non-Causal systems. [5+5]

OR

7. Define Time invariant and shift invariant systems and given the system function of a LTI system be 1/jw+2 evaluate the output of the system for an input $(0.9)^t$ u (t). [10]

8.a) Discuss and Prove Properties of auto correlation function.
b) Explain briefly extraction of a signal from noise by filtering. [5+5]

OR

9. Discuss the impact of convolution for find the system output and Use the Convolution theorem to find the spectrum of $x(t) = A\ Cos^2\omega_c t$. [10]

10.a) State the properties of the ROC of Laplace Transform and its existances.
b) Find the step response of series RL circuit using Laplace transform method. [5+5]

OR

11.a) Find the inverse Z-transform and ROC given $X(z)= \log(1/\ 1-az^{-1})$.
b) Derive relationship between z and Laplace Transform and describe about the stability. [5+5]

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R15

Code No: 123AW

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March - 2017

SIGNALS AND SYSTEMS

(Common to ECE, EIE, ETM)

Time: 3 Hours **Max. Marks: 75**

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PART-A

(25 Marks)

1.a) Determine whether a unit step signal u (t) is energy or power signal. [2]
b) Define principle of orthogonality. [3]
c) Define sampling Theorem. [2]
d) Compare Fourier series and Fourier transform. [3]
e) Explain with suitable example what is meant by an LTI system. [2]
f) Define system Bandwidth and signal Bandwidth. [3]
g) List the properties of Cross-correlation. [2]
h) Define Noise and state its properties with respect to correlation. [3]
i) List out the properties of Laplace transform. [2]
j) What is meant by region of convergence in Z Transform? [3]

PART-B

(50 Marks)

2.a) Derive the expression for trigonometric Fourier series coefficients.
b) State the dirichilet's conditions for existence of Fourier series. [6+4]

OR

3.a) Test the orthogonality of the signals sin wt cos2 wt over the interval (t_0 to t_0+T).
b) Find the exponential Fourier series of the signal x(t) = 5cos 5t+10 sin 15t. [5+5]

4.a) Find the Fourier transform of x(t) =e^{-at} u (t).
b) State and prove the convolution property of Fourier transform. [5+5]

OR

5.a) State and prove parsavels energy theorem.
b) If x (t) has Fourier transform pair X (w). Deduce the Fourier Transform of X (at-t_0).
[5+5]

6.a) Define Transfer function and state its relation with Impulse function.
b) Find the impulse response of a continuous time LTI system with
H(s) = S-1/(S+1)(S+2) such that i) Re[S] >2 ii) -1 Re[S]<2 [3+7]

OR

7.a) Derive the relation between Bandwidth and Rise time.

b) Determine whether the system governed by the equation y(n)= 5x(n) is linear or not Assume that x(n) represents the input to the system and y(n) represents its output. [5+5]

8.a) Determine the convolution of the signals X(n)={2,-1,3,2} and h(n)={1,-1,1,1}

b) What is the necessary and sufficient condition on impulse response for stability? [6+4]

OR

9.a) What is the overall impulse response h(n) when two system with impulse response $h_1(n)$ and $h_2(n)$ are connected in parallel and in series?

b) State and prove properties of convolution. [5+5]

10.a) The unilateral Laplace transform of $f\,(t)$ is $\frac{1}{s^2+s+1}$. What is the unilateral Laplace Transform of $tf\,(t)$.

b) Find the inverse Laplace transform of the functions

i) $Y(s) = 105/(5+2)^2\,(5+8)$

ii) $Y(s) = 105/(5+2)^3\,(5+8)$ [5+5]

OR

11. Find the Laplace transform of following functions:

a) Exponential function

b) Unit Step function

c) Damped sine function. [3+3+4]

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, November/December - 2017

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PART- A

(25 Marks)

1.a) If the Fourier series coefficient of x(t) is C_n, find the Fourier series coefficient of $x^*(t)$. [2]

b) How do you approximate a signal using orthogonal functions? [3]

c) What is Aliasing? [2]

d) Determine the Fourier transform of $x(t) = e^{-at} (\cos\Omega_o t)\, u(t)$. [3]

e) Give the relationship between bandwidth and rise time of a signal. [2]

f) The input and impulse response of continuous time systems are given below. Find the output of continuous time systems. $x(t) = e^{-3t}\, u(t)$, $h(t) = u(t-1)$ [3]

g) Write the relationship between autocorrelation function and power density spectrum. [2]

h) State the properties of cross-correlation. [3]

i) Define ROC of Z transform. [2]

j) Let X(s)=L{x(t)}, Determine the initial value, x(0) and the final value, $x(\infty)$, for the following signal using initial value and final value theorems.
$X(s) = 7s+6 / (s(3s+5))$ [3]

PART-B

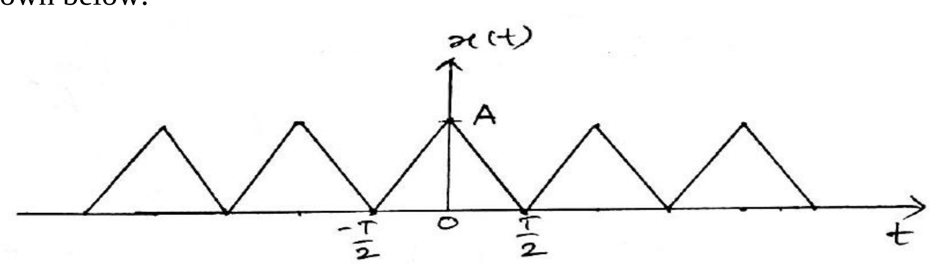
(50 Marks)

2.a) Derive from the basics, how any continuous time signal x(t) can be represented as an integral of impulses.

b) Discuss the orthogonality in complex signals. [5+5]

OR

3. Determine the exponential form of the Fourier series representation of the signal shown below. [10]



4. State and prove sampling theorem for low pass band limited signal and explain the process of reconstruction of the signal from its samples. [10]

OR

5.a) Determine the Hilbert transform for x(t) = cos(ωt) .

b) Find the Fourier transform of $x(t) = \begin{cases} e^{-|t|}; & for -1 \le t \le 1 \\ 0; & otherwise \end{cases}$. [4+6]

6.a) Find the transfer function of the system governed by the following impulse response. $h(t) = u(t) + 0.5e^{-6t} u(t) + 0.2e^{-3t} \cos t\, u(t)$.

b) Check whether the following system is linear, casual and time invariant or not. $d^3y(t)/dt^3 + 4d^2y(t)/dt^2 + 5dy(t)/dt + 2y^2(t) = x(t)$. [5+5]

OR

7. Write short notes on the following.
(a) Ideal filters characteristics.
(b) Filter characteristics of a linear system. [5+5]

8.a) State and prove Parseval's power theorem for continuous time signals.

b) Perform the convolution of the following signals, by graphical method. [4+6]

$x_1(t) = e^{-3t} u(t)$, $x_2(t) = t\, u(t)$.

OR

9.a) How do you detect the periodic signals in the presence of noise?

b) Examine the close connection between the convolution and correlation. [8+2]

10.a) Compute the Laplace transform of $x(t) = e^{-b|t|}$ for the cases of b < 0 and b > 0.

b) Obtain the inverse Laplace transform of the function $X(s) = 1 / (s^2+3s+2)$, ROC : $-2 < Re(s) < -1$. [5+5]

OR

11.a) Determine the Z-transform and sketch the pole zero plot with the ROC for the following Signal: $x(n) = (0.5)^n u(n) - (1/3)^n u[n]$.

b) Determine the inverse z-transform of
$X(z) = 1 / (1-1.5z^{-1} + 0.5z^{-2})$, where ROC : $|z|>1.0$ [5+5]