Code: 13A04302

R13

B.Tech II Year I Semester (R13) Regular & Supplementary Examinations December 2015

SIGNALS & SYSTEMS

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Find the frequencies present in a signal $x(t) = \sin 3t + \cos^2(t)$.
(b) Draw the graphical form of decaying, raising and double exponential signals.
(c) What are the characteristics of filter?
(d) How to represent periodic signals by Fourier series?
(e) List out any two Fourier transformable pairs.
(f) Determine the DTFT of $\delta(n-2)+\delta(n+2)$.
(g) Obtain the magnitude of frequency domain of unit step signal u(n).
(h) Mention the characteristics of distortion less transmission system.
(i) Differentiate Fourier, Laplace and z-Transforms.
(j) State the final value theorem of Laplace and z-transforms.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) What is the concept of impulse function? Why the amplitude is infinity at origin? Explain.
(b) Examine the continuous time system y(t)=T{x(t)}=2x(t)+3 for linearity, time invariance, causality and stability.

OR

3 (a) Why the unit step signal u(t) is not even and not odd? Separate even and odd parts of u(t).
(b) Construct the convoluted signal $x(t) = x_1(t) \otimes x_2(t)$, where $x_1(t)=u(t-1)-u(t-4)$ and $x_2(t)=u(t-2)-u(t-3)$.

UNIT – II

4 (a) List out any three properties of continuous time trigonometric Fourier series.
(b) Analyze the representation of a signal by a set of mutually orthogonal sinusoidal signals.

OR

5 (a) What is the importance of discrete time Fourier series?
(b) How discrete time filters are described with differential equations? Explain with suitable example.

UNIT – III

6 (a) Compare Fourier transform with Fourier series.
(b) Obtain the time domain representation of $X(w) = \frac{jw}{(2+jw)^2}$

OR

7 (a) State and prove convolution property of Fourier transform.
(b) Find the Fourier transform of x(n)=n(n-1)u(n). Draw its magnitude spectrum.

UNIT – IV

8 (a) What is the importance of sampling theorem in communication? Explain.
(b) Analyze the effect of under sampling in communication.

OR

9 (a) Describe time and frequency domain aspects of non-ideal filters.
(b) Give one example for first order and second order discrete time systems. Obtain the relation between output and input.

UNIT – V

10 (a) List any three Laplace transformable pairs.
(b) Solve the difference equation y(n) - 2 y(n-1) = x(n) with $x(n)= (1/3)^n u(n)$.

OR

11 (a) Analyze the various constraints on ROC for various classes of discrete time signals.
(b) Get the Z-Transform of y(n)=3x(n)+2x(n-1) for $x(n)= 3(1/2)^n u(n)+ 2(1/3)^n u(n)$.

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Code: 15A04303 **R15**

B.Tech II Year I Semester (R15) Regular Examinations November/December 2016

SIGNALS & SYSTEMS

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Define Unit impulse and Unit Step Signals.

(b) Sketch the following signals: x(t) = r(-t+2).

(c) Write short notes on Dirichlet conditions for Fourier transform.

(d) How the aliasing process is eliminated?

(e) What is meant by impulse response of any system?

(f) What do you mean by distortion less transmission through a system?

(g) If x(n) = a|n|,0 < a < 1, find the DTFT of x(n).

(h) Determine the DTFT of a DT signal.

(i) Determine the Laplace transform of δ(t) and u(t).

(j) Obtain the relationship between DTFT and Z transform.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Write the various operations on signals.

(b) Check whether the following system is static or dynamic and also causal or non-causal system: x(n) =2n.

OR

3 (a) Determine whether the following system are time invariant or not. $y(t) = tx(t)$.

(b) Explain about the properties of continuous time Fourier series.

UNIT – II

4 (a) State and prove Time shifting property and modulation property of CTFT.

(b) Determine and sketch the Fourier transform of the following signals:

(i) $x(t) = 10\ Sin\ 2\pi\ f_0 t$ (ii) $x(t) = rect\left(\frac{t}{\tau}\right)$.

OR

5 (a) Find the Fourier transform of $x(t) = \begin{cases} cos\pi t; -\frac{1}{2} \le t \le \frac{1}{2} \\ 0; \quad otherwise \end{cases}$.

(b) State and prove linearity property of CTFT.

UNIT – III

6 Let the system function of an LTI system be ${}^{1}/_{(jw+2)}$. What is the output of the system for the input $(0.8)^t u(t)$?

OR

7 A stable LTI system is characterized by the differential equation $\frac{d^2 y(t)}{dt^2} + 5\frac{d\ \ y(t)}{dt} + 4y(t) = \frac{d\,x(t)}{dt}$. Find the frequency response & Impulse response.

UNIT – IV

8 State and prove any five properties of DTFT.

OR

9 An LTI discrete system is specified by the equation:
$y[n] - 0.5y[n-1] = x[n]$. Find $H(\Omega)$, the frequency response of the system. Also determine the (zero state) response $y[n]$, if the input $x[n] = (0.8)^n u[n]$.

UNIT – V

10 Find the Inverse Laplace transform of G(s) = $\frac{S}{(S+3)(S^2+4S+5)}$ for all possible ROC.

OR

11 Find the inverse Z Transform of X(z) = 1/(1-0.5z^{-1} + 0.5z^{-2}) for ROC |Z| >1.

*****

Code: 15A04303

R15

B.Tech II Year I Semester (R15) Regular & Supplementary Examinations November/December 2017

SIGNALS & SYSTEMS

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Define energy and power signals.
(b) Define deterministic and random signals.
(c) State sampling theorem.
(d) State Dirichlets conditions.
(e) Define LTI-CT systems.
(f) What are the transforms used for the analysis of LTI-CT systems?
(g) Define DTFT & Inverse DTFT.
(h) State the Time-Scaling property of LT.
(i) State the relation between DTFT & Z-transform.
(j) List the methods used for finding the Inverse Z-transform.

PART – B

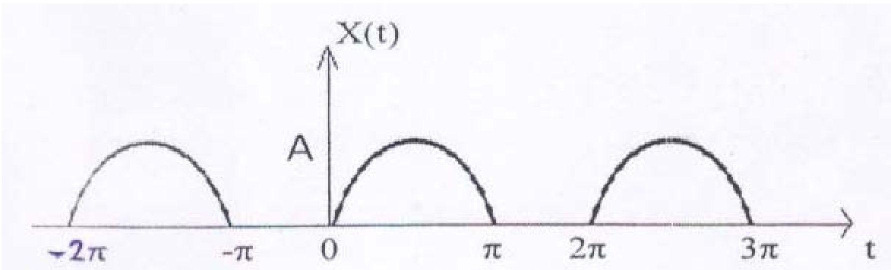
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Explain about the classifications of continuous time signals.

OR

3 Find the Cosine Fourier series of half wave rectified sine function.



UNIT – II

4 State and prove the properties of continuous time Fourier transform.

OR

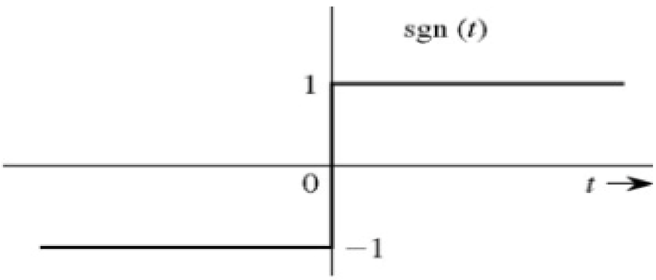
5 State and prove sampling theorem with necessary equations.

UNIT – III

6 Find the Fourier transform of $x(t) = e^{-at} u(t)$. Sketch the magnitude and phase plot.

OR

7 Find the Fourier transform of a signal sgn(t).



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UNIT – IV

8 State and prove any four properties of discrete time Fourier transform.

OR

9 Find the discrete time Fourier transform of: (i) $a^n u(n)$. (ii) $\sin\frac{n\pi}{2} u(n)$

UNIT – V

10 By using Laplace transform, solve the differential equations:

$$\frac{d^3y(t)}{dt^3} + 7\frac{d^2y(t)}{dt^2} + 16\frac{dy(t)}{dt} + 12y(t) = x(t)$$ if $x(t) = \delta(t)$, $\frac{dy(0^-)}{dt} = 0,\quad \frac{d^2y(0^-)}{dt^2} = 0,$ and $y(0^-)=0$.

OR

11 (a) Describe the Z transform and ROC in detail.

(b) Compute the Z transform of the signal $x(n) = (\sin\omega_0 n)u(n)$.

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Code: 15A04303 **R15**

B.Tech II Year I Semester (R15) Regular & Supplementary Examinations November/December 2018

SIGNALS & SYSTEMS

(Common to ECE & EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

- (a) What are the classifications of signals?
- (b) Distinguish between static and dynamic systems.
- (c) Draw the graphical form of decaying, raising and double exponential signals.
- (d) State Sampling theorem and aliasing.
- (e) State polywiener criterion.
- (f) What are the characteristics of filter?
- (g) Show the relation between Fourier and Laplace transform.
- (h) Determine the DTFT of δ(n-2) + δ(n+2).
- (i) Define Bilateral and unilateral Laplace transform.
- (j) State the final value theorem of Laplace and z-transforms.

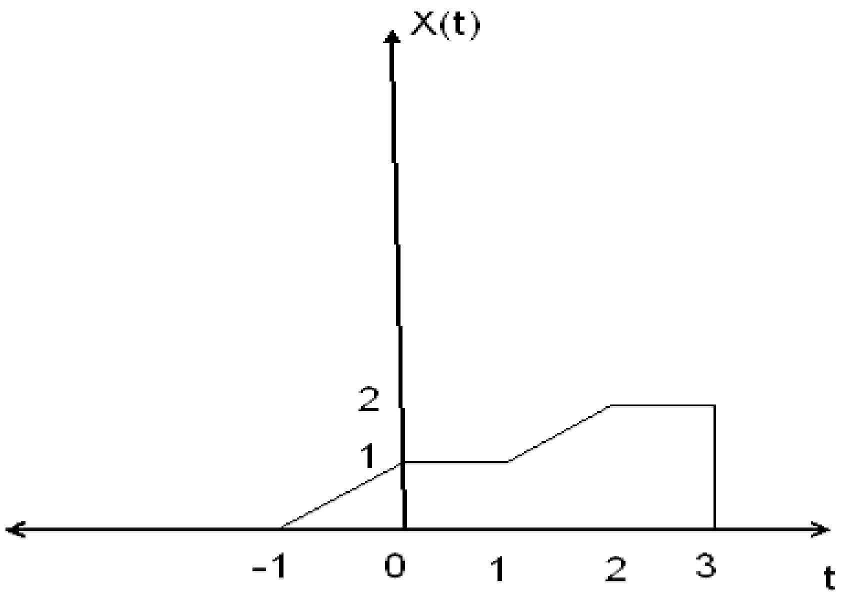
PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 The continuous time signal x(t) is shown in figure below. Sketch the following waveforms :

- 2x(4t + 2)
- x(t) u(t)
- x(t) [u (t) - u (t - 1)]
- Odd{x(t)}



OR

3 Find the exponential Fourier series for half wave rectified sine wave.

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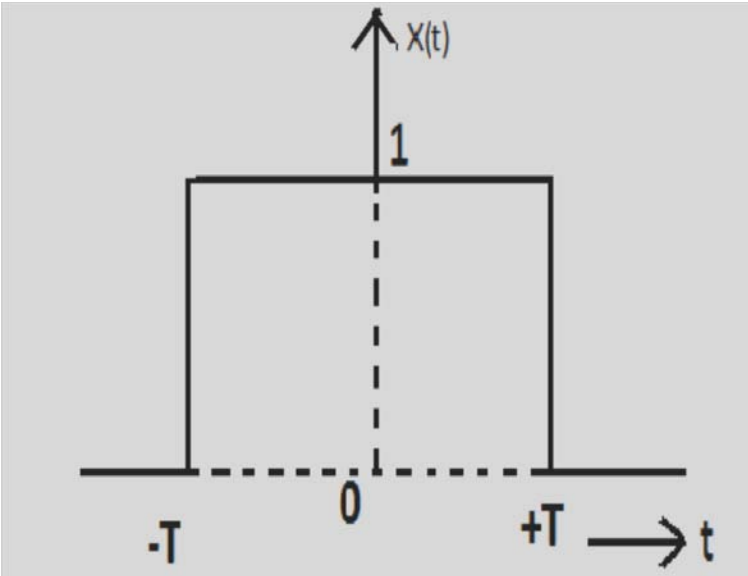
UNIT – II

4 For the rectangular pulse shown in figure below, determine the Fourier transformation of x(t) and sketch the magnitude-phase representation with respect to frequency.



OR

5 State and prove sampling theorem.

UNIT – III

6 Explain the characteristics of ideal filters and why they cannot be realized.

OR

7 Derive the relationship between rise time and bandwidth.

UNIT – IV

8 State and prove the properties of Discrete time Fourier transform.

OR

9 Find the DTFT of the rectangular pulse described by the following equation:

$$x[n] = \begin{cases} 1, & |n| \le M \\ 0, & |n| > M \end{cases}$$

UNIT – V

10 (a) Find the Laplace Transform of: (i) $x(t) = e^{-at} \sin\omega t$. (ii) $e^{-2t}u(-t)$.

(b) State and prove convolution and differentiation properties of Laplace transform.

OR

11 (a) Determine Z-Transform, ROC, pole zero locations of:

(i) $x(n) = a^n u(n)$.

(ii) $x(n) = a^n u(-n-1)$.

(b) State and prove any two properties of z- transform.

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Code: 13A04302

R13

B.Tech II Year I Semester (R13) Supplementary Examinations June 2015

SIGNALS & SYSTEMS

(Common to ECE & EIE)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

- (a) Define Signum function in time domain and sketch waveform.
- (b) Distinguish between static and dynamic systems.
- (c) State time scaling property of Fourier Series.
- (d) Explain about non recursive discrete time filter.
- (e) What is the Fourier transform impulse signal and sketch its time and frequency domains.
- (f) State time reversal property of DTFT.
- (g) Sketch ideal LPF characteristics.
- (h) What is the sampling interval for proper sampling following signal $f(t) = A\,Sin\,(200\pi t)$
- (i) Compute the initial value of signal with Laplace transform $X(s) = 7s + 10/s(s+2)$
- (j) What is the inverse z-transform of $X(z) = z/(z-1)$ if its ROC is $|z| < 1$

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 Find whether the following signals are energy or power signal or neither:
$(i)\ x(t) = e^{-5t}u(t)$ $(ii)\ x(t) = t^2\,u(t)$ $(iii) x(t) = 2\,u(t) - u(t-3)$
$(iv) x(n) = r(n) - r(n-4)$

(OR)

3 Check whether the following systems are time invariant or not.
$(i)\ \ y(t) = t^2\,x(t)$ $(ii)\ y(t) = x(-2t)$ $(iii)\ y(t) = e^{3x(t)}$ $(iv)\ y(n) = x(n)$
$(v)\ y(n) = x^2(n-2)$.

UNIT - II

4 Discuss the concept of exponential Fourier series and derive the expressions for coefficients. Also discuss the concept of line spectrum.

(OR)

5 Consider the discrete time LTI system with impulse response:

$$h(n) = \begin{cases} 1 & 0 \le n \le 2 \\ -1 & -2 \le n \le -1 \\ 0 & otherwise \end{cases}$$

Given the input to this system is

$$x(n) = \sum_{k=-\infty}^{\infty} \delta[n-4k]$$

Determine the Fourier Series coefficients of the output $y(n)$.

UNIT - III

6 (i) Find the correlation of symmetrical gate pulse with amplitude and time duration '1' with Itself.
(ii) Evaluate $u(t) * e^{-t}u(t)$

(OR)

7 (a) A linear shift – invariant system has a frequency response:
$H(e^{i\omega}) = e^{i\omega}(1/1.1 + \cos\omega)$
Find its input – output relation in time domain.

(b) Find frequency response of a LSI system whose input and output satisfy the following difference equation: $y(n) - 0.5y(n-1) = x(n) + 2x(n-1) + x(n-2)$

Contd. in page 2

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UNIT - IV

8 Derive the relationship between rise time and bandwidth.

(OR)

9 State and prove sampling theorem for band limited signals.

UNIT - V

10 (a) Describe the ROC of the signal:

$$x(t) = e^{-a|t|}$$

for $a > 0 \; and \; a \leq 0$.

(b) Find the inverse Laplace transform of:

$$X(s) = (-5s - 7)/(s + 1)(s - 1)(s + 2)$$

When ROC is $1 < Re(s) < 2$

(OR)

11 (a) Determine z-transform. Pole – zero locations and sketch of ROC of following signal:

$$x(n) = -u(-n - 1) + (1/3)^n \, u(n).$$

(b) Find the inverse z-transform of:

$x(z) = (2 + z^{-1})/(1 - 0.25z^{-1})$ with ROC $|z| > 1/4$

Using power series expansion.

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Code: 13A04302 **R13**

B.Tech II Year I Semester (R13) Supplementary Examinations June 2016

SIGNALS & SYSTEMS

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Define the unit impulse and unit step functions with neat sketches.
(b) Define energy and power signals.
(c) Write a short note on Dirichlet conditions for Fourier series.
(d) State Parseval's theorem for Discrete Fourier Series.
(e) Find the Fourier transform of Unit step function.
(f) Find the Inverse Fourier transform of $\delta(f-2)$?
(g) Write a short note on Magnitude and Phase Representation of Fourier Transform.
(h) State sampling theorem.
(i) State Final Value theorem in Laplace Transform.
(j) State any two properties of the ROC of Z-Transform.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 What is a LTI system? Determine whether the following systems are Linear and Time Invariant or not:

(i) $y(t) = \int_{-\infty}^{t} x(\tau)d\tau$.

(ii) y[n] = nx[n-1].

OR

3 (a) Define convolution. Find the convolution of two signals x[n] = u[n] and h[n] = $\alpha^n u[n]$ $0 < \alpha < 1$ and represent them graphically.

(b) Show that $x(t) * \delta(t - t_0) = x(t - t_0)$.

UNIT – II

4 (a) A train of rectangular pulses, making excursions from zero to one volt has a duration of 2µs and are separated by interval 10 µs. Assuming that the centre of one pulse is located at t = 0,obtain the trigonometric Fourier series of pulse train.

(b) Find the Fourier Series coefficient for signal x(t) = 2cos10t.

OR

5 (a) Determine the discrete Fourier series representation for the following sequences:

(i) $x[n] = \cos\left(\frac{\pi}{4}n\right)$.

(ii) $x[n] = cos^2\left(\frac{\pi}{8}n\right)$.

(b) Find the frequency response of discrete-time system described by the difference equation:

$y[n] - ay[n-1] = x[n]$

Contd. in page 2

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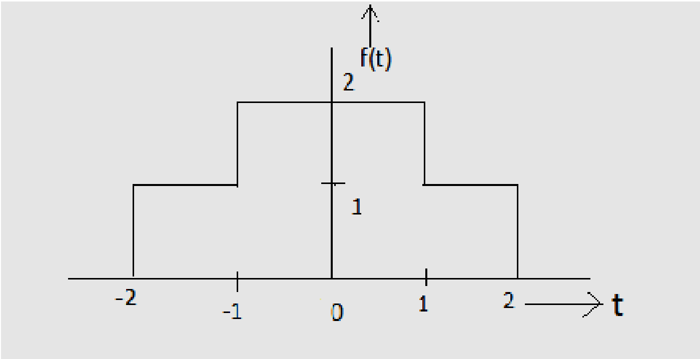
UNIT – III

6 (a) State and prove frequency shifting property of Fourier transform.

(b) Determine the Fourier transform of the signal shown in following figure below.



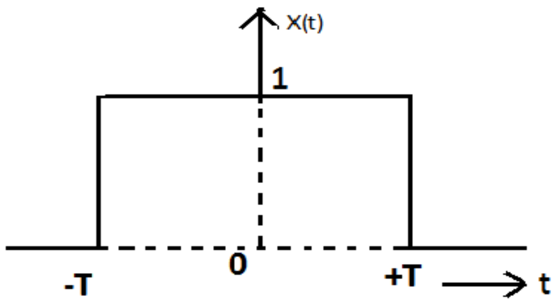
OR

7 (a) Define Discrete-Time Fourier Transform and write any four properties of DTFT.

(b) Determine the DTFT of signal $x[n] = \begin{cases} 1, & n=-1 \\ 2, & n=0 \\ -1, & n=1 \\ 1, & n=2 \\ o, & otherwise \end{cases}$

UNIT – IV

8 For the rectangular pulse shown in figure below, determine the Fourier Transform of x(t) and sketch the magnitude-phase representation with respect to frequency.



OR

9 (a) The signal g(t) = 10 cos(20πt) cos(200πt) is sampled at the rate of 250 samples per second. What is the Nyquist rate for g (t) as a low-pass signal and determine the lowest permissible sampling rate for this signal?

(b) What is Aliasing? Explain in detail with spectral details of a sample data.

UNIT – V

10 (a) Find the Laplace Transform X(S) and sketch the pole-zero plot with the ROC for the following signals x(t):

(i) x(t) = $e^{-2t}u(t) + e^{-3t}u(t)$.

(ii) x(t) = $e^{2t}u(t) + e^{-3t}u(-t)$.

(b) Find the inverse Laplace Transform of X(S):

X(S) = $\frac{2S+4}{S^2+4S+3}$, -3<Re(s) <-1

OR

11 (a) Determine the response of the system: $y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n)$ to the input signal x(n) = $\delta(n) - \frac{1}{3}\delta(n-1)$ with help of Z-Transform.

(b) Determine the inverse Z-Transform of X(Z) = ln(1 + az^{-1}); ROC |Z|>a.

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Code: 13A04302

R13

B.Tech II Year I Semester (R13) Supplementary Examinations June 2017

SIGNALS & SYSTEMS

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Find the even and odd components of the following signal x(t) = cost + sint + sint cost.
(b) What are the conditions for a system to be LTI system?
(c) Write short notes on Dirichlets conditions for Fourier series.
(d) State and prove symmetry property of Fourier series.
(e) Explain how Aperiodic signals can be represented by Fourier transform.
(f) State convolution property in relation to Fourier transform.
(g) State sampling theorem.
(h) Give the system impulse response h(t). State the conditions for stability and causality.
(i) State modulation property and multiplication in Fourier transform.
(j) What are the properties of ROC in z transform?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Consider a rectangular pulse as shown by the equation $x(t) = \begin{cases} A; & -0.5 < t < 0.5 \\ 0; & otherwise \end{cases}$. Express $x(t)$ as a weighted sum of two step functions.

(b) Explain the various operations on signals.

OR

3 (a) Write the Classification of systems based on certain properties.

(b) The I order system is described by the following difference equation y[n] = ay[n-1] + x[n] and has the impulse response h[n] = a^n u[n]. Is this system casual, memory less or BIBO stable?

UNIT – II

4 (a) Find the Fourier series for $|x|,\ -\pi < x < \pi$.

(b) Find the exponential form of the Fourier series for the signal $x(t) = 2 + 4\sin(\frac{1}{2}t + \frac{\Pi}{6}) + 3\cos(\frac{3}{5}t - \frac{\Pi}{4})$

OR

5 (a) Find the cosine Fourier series of a half wave rectified sine function.

(b) State and prove convolution property in Fourier series.

UNIT – III

6 (a) Determine Fourier transform of an impulse train.

$$x(t) = \sum_n \delta(t - nT).$$

(b) Determine DTFT of the following signal: x(n) = 4(2^n) u(n).Find the magnitude.

OR

7 (a) Find the inverse DTFT of X(e^{jw}) = 2sin2w, -Π < w < V.

(b) Determine CTFT of the following signal. $x(t) = \begin{cases} A; & for\ \ -\tau/2 \le t \le \tau/2 \\ 0; & elsewhere \end{cases}$.

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UNIT – IV

8 The input and output of a causal LTI system are related by the differential equation:

$$d^2y(t)/dt^2 + 6dy(t)/dt + 8y(t) = 2x(t)$$

(i) Find the impulse response of the system.

(ii) What is the response of this system if $x(t) = t\, e^{-2t}\, u(t)$

OR

9 Compute & plot the convolution y(t) of the given signals:

(i) X(t) = u(t-3) – u(t-5), h(t) = u(t).

(ii) X(t) = u(t), h(t) = u(t).

UNIT – V

10 The system function of the LTI system is given as $H(Z) = (3-4(Z^{-1})) / (1 - 3.5Z^{-1} + 1.5Z^{-2})$. Specify the ROC of H(Z) and determine h(n) for the following condition: (i) Stable system. (ii) Causal system.

OR

11 A system is described by the differential equation:

$$d^2y(t)/dt^2+3dy(t)/dt + 2y(t) = dx(t)/dt \text{ if } y(0) = 2;\ dy(0)/dt = 1 \text{ and } x(t) = e^{-t}\, u(t)$$

Use Laplace transform to determine the response of the system to a unit step input applied at t = 0.

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Code: 13A04302 **R13**

B.Tech II Year I Semester (R13) Supplementary Examinations November/December 2016

SIGNALS & SYSTEMS

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Derive any two properties of Impulse function.

(b) Determine whether the given signal f(t) = Rect(t/ τ) is energy or power & calculate the energy or power.

(c) Write Dirichlet conditions for Fourier Series.

(d) What is the relationship between Trigonometric and Exponential Fourier series?

(e) Find the Fourier transform of f(t) = f(t-2) + f(t+2).

(f) Derive Fourier transform of any general Periodic signal.

(g) Determine the Nyquist sampling interval of the signal f(t)= sinc(100πt) + 3 $sinc^2(60\pi t)$.

(h) Find the inverse Z-transform of X(Z) = $3Z^{-1}/ [(1-Z^{-1})(1-2Z^{-1})]$ when ROC is $\{|Z|> 2\}$ using the partial fraction method.

(i) Find the Laplace transform of $f(t)=t^2 e^{-3t} u(t)$.

(j) Define the Transfer Function and what its relation with Impulse response.

PART – B

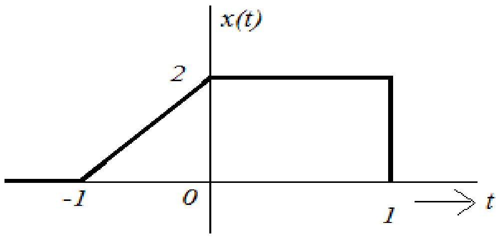
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) Find whether the signal f(t) = 10 Sin (12πt) + 2 u(t) is periodic or not? If periodic what is its fundamental period.

(b) Determine the response of the relaxed system characterized by the impulse response: $H(n) = (1/3)^n u(n)$ to the input signal $x(n) = 2^n u(n)$.

(c) Plot the Even and Odd components of a given signal x(t).

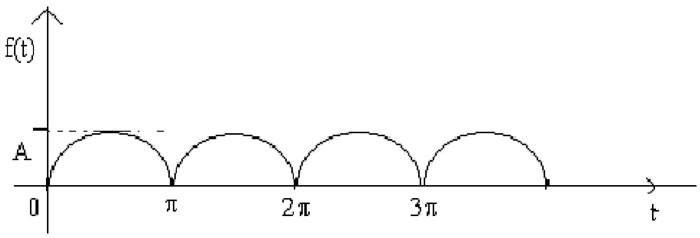


OR

3 Classify the systems based on the properties and explain each with an example.

UNIT – II

4 (a) Find the Exponential Fourier series expansion of the rectified Sine wave form shown below.



(b) Obtain the Fourier series representation of an impulse train given by: x(t) = δ(t − nT).

OR

5 (a) Determine the spectra of the signal x(n) = 3 cos0.4πn + 5 sin(π/2)n.

(b) Derive the power density spectrum of periodic signal.

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Contd. in page 2

UNIT – III

6 (a) Find the Fourier transform of the function $x(t) = [u(t+2) - u(t-2)]\cos 2\pi t$ using frequency convolution property.

(b) Find the Fourier transform of the function $x(t) = t\, e^{-2t}\, u(t)$ using frequency differentiation property.

OR

7 (a) Find the Fourier transform of the function $x(n) = [1/2]^{|n-1}$.

(b) State and prove Parseval's theorem for discrete time Aperiodic signals.

UNIT – IV

8 Determine and sketch the magnitude and phase spectrum of $y(n) = ½ [x(n)+x(n-2)]$.

OR

9 (a) State sampling Theorem for band-limited signals. What is Aliasing effect?

(b) The signal $x(t) = 10 \cos (10\pi t)$ is sampled at a rate 8 samples per second. Plot the amplitude spectrum for $|\Omega| \le 30\pi$. Can the original signal can be recovered from samples.

UNIT – V

10 (a) Derive the relation between Laplace transform and Fourier transform of continuous time signal x(t)

(b) Use the convolution theorem of Laplace transform to find $y(t)= x_1(t) * x_2(t)$ where $x_1(t) = \cos(4t)\, u(t)$ and $x_2(t) = \sin(2t)\, u(t)$.

OR

11 Find the response of LTI discrete time system specified by the equation: $y(n)-(3/2)\, y(n-1)+(1/2)\, y(n-2) = 2x(n)+(3/2)\, x(n-1)$ if the initial conditions are $y(-1)=0$, $y(-2)=1$ and the input $x(n) = (1/4)^n\, u(n)$.

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Code: 15A04303

R15

B.Tech II Year I Semester (R15) Supplementary Examinations June 2017

SIGNALS & SYSTEMS

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) State the relation between step, ramp and delta functions (CT).
(b) Define Quadrature Fourier Series.
(c) Define memory and memory less system.
(d) State Sampling theorem and aliasing
(e) The impulse response of the LTI CT system is given as h(t) = e-t u(t). Determine transfer function and check whether the system is causal and stable.
(f) List the applications of FFT.
(g) If u(n) is the impulse response of the system, What is its step response?
(h) Determine the discrete-time convolution sum of the given sequences: x(n) ={1, 2, 3, 4} and h(n)= {1, 5, 1}
(i) Define Bilateral and unilateral Laplace transform.
(j) What are the properties of ROC?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

PQP

UNIT – I

2 (a) Define a signal and a system. With neat sketches for illustration, briefly describe the five commonly used methods of classifying signals based on different features.
(b) Find the trigonometric Fourier series representation of a periodic signal x(t) = t, for the interval of t = -1 to t = 1.

OR

3 (a) Distinguish between: (i) Deterministic and random signals. (ii) Energy and periodic signals. Give examples.
(b) Find the exponential Fourier series for half wave rectified sine wave.

UNIT – II

4 (a) Show that the product of two even signals or two odd signals is an even signal and that the product of an even and an odd signal is an odd signal.
(b) Write any four properties of FT with proofs.

OR

5 (a) Find the convolution integral of x(t) and h(t), and sketch the convolved signal:
x(t) = (t -1){u(t -1) +u(t -3)} and h(t)= [u(t +1) - 2u(t -2)].
(b) Discuss about sampling theorem of low pass signals.

UNIT – III

6 (a) What do you mean by impulse response of an LTI system? Deduce the equation for the response of an LTI system, if the input sequence x(n) and the impulse response are given.
(b) The input x (t) and the impulse response h (t) of a continuous time LTI system are given by:
$x(t) = u(t) \qquad h(t) = e^{-\alpha t}u(t), \alpha > 0$
Compute the output y(t).

OR

7 (a) Explain any four properties of continuous and/or discrete time systems. Illustrate with suitable examples.
(b) Determine the discrete-time convolution sum of the given sequences. x(n) ={1, 2, 3, 4} and h(n)= {1, 5, 1}.

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UNIT – IV

8 State and prove any four properties of discrete time Fourier transform.

OR

9 Find the discrete time Fourier transform of: (i) $a^n u(n)$. (ii) $\sin\frac{n\pi}{2} u(n)$

UNIT – V

10 By using Laplace transform, solve the differential equations:

$$\frac{d^3y(t)}{dt^3}+7\frac{d^2y(t)}{dt^2}+16\frac{dy(t)}{dt}+12y(t)=x(t)$$ if $x(t) = \delta(t)$, $\frac{dy(0^-)}{dt}=0$, $\frac{d^2y(0^-)}{dt^2}=0$, and $y(0^-)=0$.

OR

11 (a) Describe the Z transform and ROC in detail.

(b) Compute the Z transform of the signal $x(n) = (\sin\omega_0 n)u(n)$.

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Code: 15A04303

R15

B.Tech II Year I Semester (R15) Supplementary Examinations June 2018

SIGNALS & SYSTEMS

(Common to ECE & EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

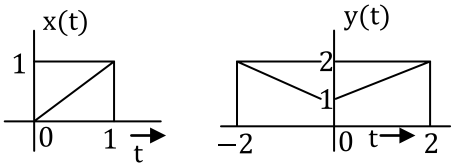
1 Answer the following: (10 X 02 = 20 Marks)

(a) Distinguish between energy and power signal.

(b) State the conditions for the convergence of Fourier transform.

(c) A pair of sinusoidal signals with a common angular frequency is defined by $x_1[n] = \sin[5\pi n]$ and $x_2[n] = \sqrt{3}\cos[5\pi n]$. Specify the condition, that the period N of both and $x_2[n]$ must satisfy for them to be periodic.

(d) Express the signal y(t) in terms of x(t).



(e) Compute $y[n] = x[n] * h[n]$, whre $x[n] = \alpha^n u[n],\ h[n] = \beta^n u[n]$.

(f) Define the conditions for a system to be causal.

(g) Define system bandwidth.

(h) Is Fourier transform of a discrete time signal continuous or discrete? Justify your answer.

(i) Deduce the relationship between bandwidth and rise time.

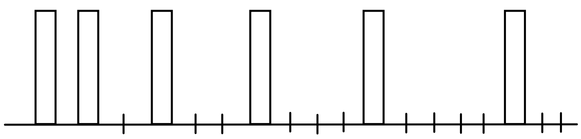
(j) Give the relationship between Fourier transform and Z-transform.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 (a) A binary signal $x(t) = 0$ for $t < 0$. For positive time, $x(t)$ toggles between one and zero as follows: One for 1 second, zero for 1 second, one for 1 second, zero for 2 seconds, one for 1 second, zero for 3 seconds, and so forth. That is, the "on" time is always one second but the "off" time successively increases by one second between each toggle. A portion of $x(t)$ is shown below. Determine the energy and power of $x(t)$.



(b) Determine whether the following signals are periodic or not. If periodic, deduce the period of the same: (i) $x(n) = \cos\left(\frac{1}{4}n\right)$. (ii) $x(n) = \cos^2\left(\frac{\pi}{8}n\right)$.

OR

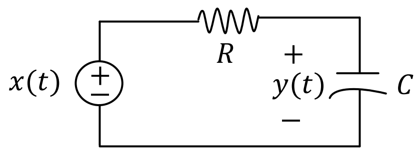
3 (a) Consider a continuous-time LTI system described by $y(t) = T\{x(t)\} = \frac{1}{T}\int_{t-\frac{T}{2}}^{t+\frac{T}{2}} x(\tau)d\tau$. Find and sketch the impulse response $h(t)$ of the system. Is the system causal?

(b) Prove that the complex sinusoids with frequencies separated by an integer multiple of the fundamental frequency are ORTHOGONAL and hence derive expressions for DTFS.

Contd. in page 2

UNIT – II

4 (a) Find the Fourier series representation for output y(t) of the RC circuit shown in response to the square wave input. Assume $T_S/T = 1/4$, T = 1s, RC = 0.1s.



(b) State and prove sampling theorem for low pass signals.

OR

5 (a) State and prove convolution property.

(b) Let the input to a system with impulse response $h(t) = 2e^{-t}\, u(t)$ be $x(t) = 3e^{-t}\, u(t)$. Use the convolution property to find the output of the system, y(t).

UNIT – III

6 Deduce the conditions for distortion less transmission through a system.

OR

7 (a) Deduce the Poly Wiener criterion for physical realization of the systems.

(b) Deduce the relationship between power spectral density and autocorrelation function.

UNIT – IV

8 (a) Consider the DFT {2, 1+j, 0, 1-j}. Evaluate the IDFT.

(b) State and prove circular convolution property.

OR

9 Deduce the circular convolution of the sequences $[2\ 2\ 2\ 2]$ and $[2\ 2\ 2\ 2]$. Explain the relationship between circular and linear convolutions.

UNIT – V

10 (a) State and prove differentiation property in Laplace transforms.

(b) Deduce the Laplace transform of the following signal:

$$X(t) = (e^{-t}\cos 2t - 5\, e^{-2t})\, u(t) + 0.5\, e^{2t}\, u(-t)$$

OR

11 (a) Find the inverse Laplace transform of the following:

$$X(s) = \frac{1}{s(s+1)^2} \quad re(s) > -1$$

(b) Find the z-transform and the associated ROC for the following sequence:

$$x[n] = a^{n+1}\, u[n+1]$$

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Code: 15A04303

R15

B.Tech II Year I Semester (R15) Supplementary Examinations June/July 2019

SIGNALS & SYSTEMS

(Common to ECE & EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

(a) Differentiate energy and power signals.
(b) State time scaling property of Fourier series.
(c) State Parseval's relations in continuous time Fourier transform.
(d) What is aliasing?
(e) Mention the relationship between rise time and bandwidth.
(f) Sketch ideal LPF characteristics.
(g) State linear time invariant system.
(h) Determine the DTFT of $h(n) = \delta(n-n_0)$.
(i) State final value theorem in Laplace transform.
(j) Mention any two properties of the ROC of Z-transform.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Define a signal and a system. With neat sketches for illustration, briefly describe the five commonly used methods of classifying signals based on different features.

OR

3 Find the trigonometric Fourier series representation of a periodic signal x(t) = t, for the interval of t = -1 to t = 1.

UNIT – II

4 State and prove sampling theorem in frequency domain.

OR

5 Find Fourier transform of x(t)=sgn(t).

UNIT – III

6 Derive the relationship between system bandwidth and signal rise time.

OR

7 Sketch and explain the frequency response of ideal LPF, HPF, BPF and BRF.

UNIT – IV

8 Find the DTFT of the following:

(a) $x(n) = \{1, -1, 2, 2\}$.
(b) $x(n) = 0.5^n u(n) + 2^n(u(-n-1)$.

OR

9 Determine the DTFT of $x(n)=1,\ 0 \le n \le N-1$.
$= 0$, otherwise.

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UNIT – V

10 A system is described by the differential equation: $d^2y(t)/dt^2+3dy(t)/dt+2y(t) = dx(t)/dt$ if $y(0) = 2$; $dy(0)/dt = 1$ and $x(t) = e^{-t} u(t)$. Use Laplace transform to determine the response of the system to a unit step input applied at $t = 0$.

OR

11 (a) Discuss in detail the relationship between Laplace transform and z transform. What is the region of convergence for z transform?

(b) Find the z transform of $x[n] = a^n u[-n-1]$.

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