Code No: RT21044 **R13** SET - 1

II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

~~~~~~

PART –A

1. a) Write any two properties of Fourier series. (4M)
   b) What is aliasing? How can it be reduced? (3M)
   c) Explain about Linearity of a system. (3M)
   d) The auto-correlation of a continuous time signal is $R_x(\tau) = 10e^{-2\tau}$. Find its energy spectral density. (4M)
   e) Explain the concept of region of convergence (ROC) for Laplace transforms. (4M)
   f) Explain the time reversal property for Z - transform. (4M)

PART -B

2. a) Define orthogonal signal space and bring out clearly its application in representing a signal. (8M)
   b) Show that whether $x(t) = A\, e^{-\alpha(t)}\, u(t)$, $\alpha > 0$ is an energy signal or not. (8M)

3. a) Find the energy spectral density of the signal x(t) = 10 Sinc 10t. Also find its total energy. (8M)
   b) Signal x(t) has Fourier Transform $x(f) = [\, j2\pi f \,] / [3+(j / 10)]$. What is total net area under the signal x(t). (8M)

4. a) Explain about LTI system by taking an example. (8M)
   b) Discuss about the Causality and physical reliability of a system. (8M)

5. a) For the signal $g(t) = 2a/(t^2+a^2)$,determine the essential Band width B Hz of g(t) such that the energy contained in the spectral components of g(t) of frequencies below B Hz is 99% of signal energy Eg. (8M)
   b) Explain the method of detection of periodic signals in the presence of noise by correlation. (8M)

6. a) Explain the Linearity and time shifting properties of Laplace transform. (8M)
   b) Find the Laplace transform of t u (t). List any 2 properties of ROC for Laplace transforms. (8M)

7. a) Solve $X(Z) = Z^2 (1 - 1/2\ Z^{-1}) (1 + Z^{-1}) (1 - Z^{-1})$ (8M)
   b) Explain the properties of ROC for Z Transforms. (8M)

*****
~~~~~~

Code No: RT21044 **R13** SET - 2

II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

~~~~~~

PART –A

1.	a)	Differentiate between Fourier series and Fourier transform.	(4M)
	b)	Find the Fourier transform of the signal x(t) = 20 sinc (20t).	(4M)
	c)	The transfer function of a continuous time system is H(s) = 5/ s+5. Test if the system is stable?	(4M)
	d)	Write any 2 Properties of Convolution.	(4M)
	e)	Explain the relation between L.T, and F.T. of a signal.	(3M)
	f)	Explain the time shifting property for Z - transform.	(3M)

PART -B

2.	a)	Obtain the condition under which two signals f1(t) & f2 (t) are said to be orthogonal to each other. Hence, prove that Sin (nw_0t) and Cos (mw_0t) are orthogonal to each other for all integer values of m,n.	(8M)
	b)	Explain any 3 properties of Fourier Series.	(8M)
3.	a)	Find the Fourier transforms of an even function $x_e(t)$ and odd function $x_o(t)$ of x(t).	(8M)
	b)	Differentiate between energy and power signals.	(8M)
4.	a)	Explain the difference between the following systems. i) Linear and non-linear systems. ii) Time variant and time invariant systems.	(8M)
	b)	Find the DTFT of the discrete signal x(n)=nu(n).	(8M)
5.	a)	Explain the method of detection of periodic signals in the presence of noise by correlation.	(8M)
	b)	Explain the relation between auto correlation function and energy/power spectral density function.	(8M)
6.	a)	Explain the Scaling and Frequency shifting properties of Laplace transform.	(8M)
	b)	Find the inverse Laplace transform of F(s) = (s + 4) / (s+3) (s+2) ; -3 < Re(s) < -2.	(8M)
7.	a)	Explain the concept of ROC in Z- transforms and list any 2 properties of the same.	(8M)
	b)	Find the inverse of Z transform of X (Z) = Z / ($3Z^2$- 4Z+1).	(8M)

*****
~~~~~~

Code No: RT21044 **R13** SET - 3

II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

~~~~~~

PART –A

1.	a)	Test if the two signals $x_1(t) = A \cos 100t$, $x_2(t) = 2A \cos 200t$ are orthogonal in the interval $0 < t < T$ where T is time period of $x_1(t)$.	(4M)
	b)	What is Hilbert transform?	(3M)
	c)	$Y(t) = ax^2(t) + b$. Test for linearity and time variance.	(4M)
	d)	Write the Parseval's identity for the discrete Fourier series.	(4M)
	e)	Explain any 2 properties of Laplace transform.	(4M)
	f)	Explain the linearity property for Z - transform.	(3M)

PART –B

2.	a)	Prove that the complex exponential functions are orthogonal functions.	(8M)
	b)	State the properties of Fourier series.	(8M)
3.	a)	Explain the importance of Sampling theorem. What is aliasing and how is it avoided.	(8M)
	b)	An AM signal is given by $f(t) = 15 \text{ Sin } (2\pi\ 10^6\ t) + [\ 5 \text{ Cos } 2\pi\ 10^3\ t + 3 \text{ Sin} 2\pi\ 10^2 t]\ \text{Sin } 2\pi\ 10^6\ t$. Find the Fourier Transform and draw its spectrum.	(8M)
4.	a)	Find the impulse response of series RC limit. Explain the difference between causal and non-causal systems.	(8M)
	b)	Write notes on Distortion less transmission through a system.	(8M)
5.	a)	What is Hilbert Transform and give its importance. Also state Parseval's theorem.	(8M)
	b)	Explain Cross correlation and Auto correlation of functions. Discuss the properties of correlation function.	(8M)
6.	a)	Explain the Time convolution and Scaling properties of Laplace transform.	(8M)
	b)	Find the inverse Laplace transform of $x(s) = 2s / (s+1)^2 (s+2)$; $Re(s) < -2$. Given that the ROC lies to the left of s = -2.	(8M)
7.	a)	Derive the relation between Z transform and Fourier transform.	(8M)
	b)	Find the inverse Z-transform of $X(Z) = Z / [Z (Z-1) (Z-2)]$ for $\lvert Z \rvert > 2$.	(8M)

*****
~~~~~~

Code No: RT21044 **R13** SET - 4

II B. Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2016
SIGNALS AND SYSTEMS
(Com. to ECE, EIE, ECC)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

~~~~~~

PART –A

1.	a)	Prove that Sin n ω_0 t & Cos m ω_0 t are orthogonal to each other.	(4M)
	b)	State the time differentiation property of Fourier transform.	(3M)
	c)	Test if the system described by the transfer relationship y(t) = t x(t) is linear.	(4M)
	d)	Explain the relation between convolution and correlation.	(4M)
	e)	L.T [f(2t)] = ____	(3M)
	f)	Distinguish between Laplace, Fourier and Z transforms.	(4M)

PART -B

2.	a)	State and explain the Dirichlets Conditions.	(8M)
	b)	Differentiate clearly between the even, odd and half wave symmetry waveforms with respect to their Fourier co-efficients (use appropriate waveform) in their Fourier series representation.	(8M)
3.	a)	Determine the Fourier transform of a two sided exponential pulse $x(t) = e^{-|t|}$.	(8M)
	b)	State and prove the following properties of Fourier transform. i) Duality ii) Time-shifting	(8M)
4.	a)	Find the impulse response of series RL circuit. What is an LTI system? Explain its properties	(8M)
	b)	Consider a causal LTI system with frequency response H (jw) = 1 / (3+jw). For a particular input x(t) this system is observed to produce the Output = e^{-3t} u (t) – e^{-4t} u (t). Find x(t).	(8M)
5.	a)	State and explain Parseval's theorem.	(8M)
	b)	Discuss the properties of correlation function.	(8M)
6.	a)	Discuss any 3 properties of Laplace transform.	(8M)
	b)	Find the inverse Laplace transform of x(s) = 5(s+5)/ s(s+3) (s+7); Re(s) > -3	(8M)
7.	a)	Prove the differentiation property of Z-transform. Explain the concept of ROC in Z transform.	(8M)
	b)	Using Z-transforms find $x_1(n) \otimes x_2(n)$ if $x_1(n) = u(n)$ and $x_2(n) = (1/2)^n u(n)$.	(8M)

*****

||''|'''|''|'|''''||
~~~~~~