INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

ASSIGNMENT

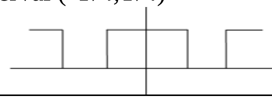
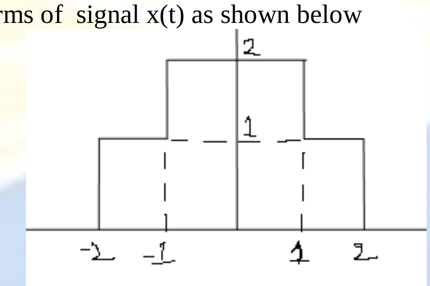
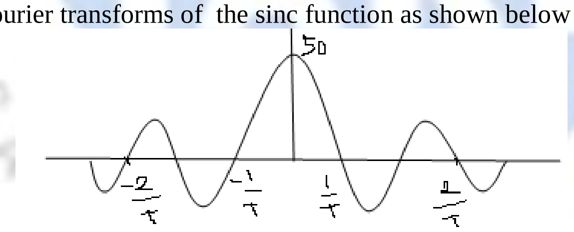
Course Name	:	**SIGNALS AND SYSTEMS**
Course Code	:	**A30406**
Class	:	II - B. Tech 1st semester
Branch	:	Electronics and Communication Engineering
Year	:	2015 – 2016
Course Faculty	:	Mrs. L Shruthi, Mr. N NagaRaju

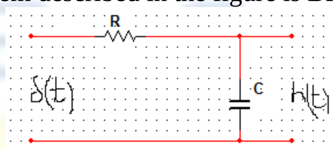
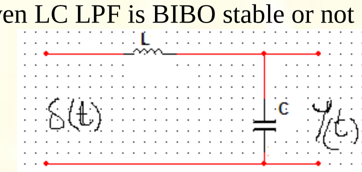
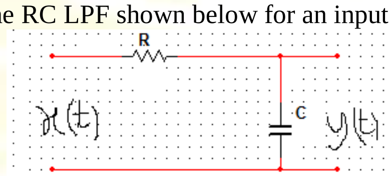
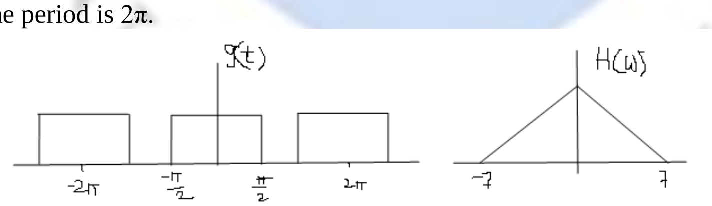
OBJECTIVES

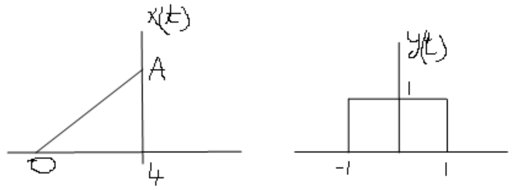
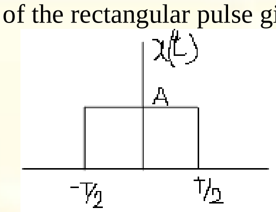
To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should Understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

S. No	Question	Blooms Taxonomy Level	Course Outcome
	ASSIGNMENT-I **UNIT-I** **Signal Analysis and Fourier series**		
1	Define energy and power signals?	Remember	2
2	Define even and odd signal?	Understand	2
3	Define the Parseval's Theorem?	Remember	2
4	Write short notes on Dirichlet's conditions for fourier series.	Understand	5
5	State Time Shifting property in relation to fourier series.	Remember	5
6	Obtain Fourier Series Coefficients for $x(n) = sinw_0n$	Remember	5
7	A rectangular function is defined as $$f(t) = \begin{cases} A, & 0 < t < \pi/2 \\ -A, & \frac{\pi}{2} < t < 3\pi/2 \\ A, & \frac{3\pi}{2} < t < 2\pi \end{cases}$$ Approximate the above function by A cos t between the intervals (0,2π) such that the mean square error is minimum.	Apply	1
8	A rectangular function is defined as $$f(t) = \begin{cases} 1, & 0 < t < \pi \\ -1, & \pi < t < 2\pi \end{cases}$$ Approximate the above function by a single sinusoid sint between the intervals(0,2π) , Apply the mean square error in this approximation.	Apply	1
9	With regard to fourier series representation, justify the following statement	Understand	5

S. No	Question	Blooms Taxonomy Level	Course Outcome
	a) odd functions have only sine terms b) even functions have no sine terms c) functions with half-wave symmetry have only odd harmonics		
10	Obtain the trigonometric fourier series for the periodic rectangular waveform as shown below for the interval (-T/4,T/4) 	Understand	5
	UNIT-II **Fourier Transforms and Sampling**		
1	Find the fourier transform of the following a) real exponential, $x(t)= e^{-at} u(t), a>0$ b) rectangular pulse, $x(t) = \begin{cases} 1, & -T \le t \le T \\ 0, & \lvert t\rvert > T \end{cases}$ c) $x(t)= e^{at} u(-t), a>0$	Apply	5
2	a) Find the fourier transform of a gate function $\prod(t) = \begin{cases} 1, & \lvert t\rvert < 1/2 \\ 0, & \lvert t\rvert > 1/2 \end{cases}$ b) Find the fourier transform of x(t)=1	Understand	5
3	Find the fourier transforms of a) cos wt u(t) b) sin wt u(t) c) cos (wt+Ø) d) e^{jwt}	Apply	5
4	Find the fourier transforms of signal x(t) as shown below 	Understand	5
5	Determine the fourier transforms of the sinc function as shown below 	Apply	5
6	State Sampling theorem.	Understand	6
7	What is meant by aliasing.	Understand	6
8	Define nyquist rate.	Remember	6
9	What is the Nyquist Frequency for the signal $x(t) = 3 \cos 50t + 10 \sin 300t - \cos 100t$?	Remember	6
10	What is the period of the signal $x(t) = 10\sin 12pt + 4 \cos 18pt$	Apply	6
	UNIT-III **Signal Transmission Through Linear Systems**		
1	Determine whether the following input-output equations are linear or non linear. a) $y(t)=x^2(t)$ b) $y(t)=x(t^2)$ c) $y(t)=t^2x(t-1)$ d) $y(t)=x(t) \cos 50\pi t$	Understand	3
2	Find whether the following system are static or dynamic a) $y(t)= x(t^2)$ b) $y(t)=e^{x(t)}$ c) $y(t) = \int_{\tau=0}^{\infty} x(t-\tau)d\tau$	Remember	3
3	Find whether the following systems are causal or non-causal	Understand	3

S. No	Question	Blooms Taxonomy Level	Course Outcome
	a) y(t)=x(-t) b) y(t)=x(t+10)+x(t) c) y(t)=x(sin(t)) d) y(t)=x(t) sin(t+1)		
4	Determine whether the following systems are time-varying or time-invariant a) y(t)=tx(t) b) $y(t)=t^2 x(t-1)$ c) $y(t)=a[x(t)]^2+bx(t)$ d) y(t)=x(t) cos 50πt	Understand	3
5	Show that the following systems are LTI systems a) y(t)=x(t/4) b) $y(t)=\begin{cases} x(t)+x(t-4), & t\geq 0 \\ 0, & t<0 \end{cases}$	Understand	3
	ASSIGNMENT-II **UNIT-III** **Signal Transmission Through Linear Systems**		
1	Test whether the system described in the figure is BIBO stable or not 	Apply	4
2	Test whether the given LC LPF is BIBO stable or not 	Understand	4
3	Find the voltage of the RC LPF shown below for an input voltage of te^{-at} 	Apply	4
4	The impulse response of a continuous time system is expressed as $h(t)=\frac{1}{RC}e^{-\frac{t}{RC}}u(t)$ find the frequency response and plot the magnitude and phase plots	Understand	4
5	A system produces an output of $y(t)=e^{-t}u(t)$ for an input of $x(t)=e^{-2t}u(t)$. Determine the impulse response and frequency response of the system	Understand	4
	UNIT-IV **Convolution and Correlation of Signals**		
1	The periodic signal g(t) is passed through a filter with transfer function H(w) shown in figure below. Determine the PSD and RMS value of the input signal. Assume the period is 2π. 	Remember	4
2	A filter has an input $x(t)=e^{-2t}u(t)$ and transfer function, H(w)=1/(1+jw). Find the ESD of the output?	Apply	4
3	The auto correlation function of signal is given below i) $R(\tau)=e^{-\tau^2/2\sigma^2}$ ii) $R(\tau)=e^{-2a\|\tau\|}$ Determine the PSD and the normalized average power content of the signal	Apply	4
4	Determine the auto and cross correlation and PSDand ESD of the following signal x(t)=Asin(wt+Ø)	Apply	4
5	Find the convolution of the two continuous-time functions	Understand	4

S. No	Question	Blooms Taxonomy Level	Course Outcome
	x(t)= 3 cos2t for all t and y(t)=$e^{-\|t\|} = \begin{cases} e^{t}; t < 0 \\ e^{-t}; t \geq 0 \end{cases}$		
6	Determine the convolution of two functions x(t)=a e^{-at} ; y(t)= u(t)	Apply	4
7	Find the convolution of the functions x(t) and y(t) as shown below 	Apply	4
8	Determine the energy and power for the following signals and hence determine whether the signal id energy or power signal i) x(t)=e^{-3t} ii) x(t)=$e^{-3\|t\|}$ iii) x(t)= e^{-10t} u(t) iv) x(t)=A $e^{j2\pi at}$	Apply	4
9	Find the convolution of the rectangular pulse given below with itself 	Apply	4
10	Determine the energy spectral density (ESD) of a gate function of width τ and amplitude A.	Understand	4
	UNIT-V **Laplace Transforms and Z-Transforms**		
1	Using the power series expansion technique, find the inverse z-transform of the following X(z): i) X(z)= $\frac{z}{2z^2-3z+1}$; |z|<1/2 ii) X(z)= $\frac{z}{2z^2-3z+1}$; |z|>1	Apply	5
2	Find the inverse Z-transform of X(z)= $\frac{z}{z(z-1)(z-2)^2}$; |z|>2 using partial fraction	Understand	5
3	Find inverse z-transform of X(z) using long division method X(z)= $\frac{2+3z^{-1}}{(1+z^{-1})(1+0.25z^{-1}-\frac{(z-2)}{8})}$	Apply	5
4	Find the Laplace transform of the following function , x(t)= (1/t) $\sin^2$ wt	Apply	5
5	Obtain the inverse Laplace transform of the function $ln\left\{\frac{s+a}{s+b}\right\}$	Apply	5
6	Determine the Laplace transform and associated region of convergence and pole-zero plot for the following function of time. x(t)= e^{-2t} u(t) + e^{3t} u(t)	Apply	5
7	Find the z-transform of the following sequences i) x[n]= a^{-n} u[-n-1] ii) x[n]= u[-n] iii) x[n]= -a^{n} u[-n-1]	Understand	5
8	Find the Laplace Transforms of the following functions a) exponential function b) unit step function c) hyperbolic sine & cosine d) damped sine function e) damped hyperbolic cosine & sine f) power 'n'	Remember	5
9	Find the inverse Laplace transform of the functions i) Y(s)= $\frac{10s}{(s+2)^2\,(s+8)}$ ii) Y(s)= $\frac{10s}{(s+2)^3\,(s+8)}$	Remember	5
10	Find the z-transform and ROC of the following sequences i) x[n]=[4(5n)-3(4n)] u(n) ii) $(1/3)^n$ u[-n] iii) $(1/3)^n$ [u[-n]-u[n-8]]	Apply	5

Prepared By: Mrs. L Shruthi, Assistant Professor

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