KAKATIYA INSTITUTE OF TECHNOLOGY AND SCIENCE: WARANGAL-15

Assignment – I

Class	:	II/IV B.Tech II-Semester
Subject	:	EC 225 - Signals & Systems (Common for ECE, EIE and EEE)
Assignment to be submitted on : 29.12.2014		

I). Are the following periodic? If so, give the period.

S.No.	*Problem*	*Answer*
1.	$x(t) = 4\cos(5\pi t - \pi/4)$	T=2/5 Sec.
2.	$x(t) = 4u(t) + 2\sin(3t)$	Not Periodic
3.	$x(t) = 4\cos(3t + \pi/4) + u(t)$	Not Periodic
4.	$x(t) = 4\cos(3\pi t + \pi/4) + 2\cos(4\pi t)$	Periodic $T_1/T_2=4/3$
5.	$x(t) = 4\cos(3\pi t + \pi/2) + 2\cos(8\pi t + \pi/2)$	Periodic $T_1/T_2=8/3$
6.	$x(t) = 2\cos(3\pi t + \pi/2) + 4\cos(10t - \pi/2)$	Not Periodic
7.	$x(t) = \cos(4t) + 2\sin(8t)$	Periodic $T_1/T_2=2$
8.	$x(t) = e^{-\lvert t \rvert}$	Not Periodic

II). Find the even and odd parts of the following signals.

S.No.	*Problem*	*Answer*
1.	$x(t) = \cos(t) + \sin(t) + \cos(t)\sin(t)$	Even: $\cos(t)$ Odd : $\sin(t)+\cos(t)\sin(t)$
2.	$x(t) = \sin(t) + 2\sin(t) + 2\sin^2(t)\cos(t)$	Even: $2\sin^2(t)\cos(t)$ Odd : $\sin(t)+2\sin(t)$
3.	$x(t) = \sin 2t + \cos 4t + 1$	Even: $\cos 4t + 1$ Odd : $\sin 2t$
4.	$x(t) = (1+t^3)\cos^3(10t)$	Even: $\cos^3(10t)$ Odd : $t^3\cos^3(10t)$

III). Categorize each of the following signals as an energy signal or power signal, and find the energy or power of the signal.

S.No.	*Problem*	*Answer*
1.	$x(t) = \cos(2\pi t)u(t)u(2-t)$	E = 2J
2.	$x(t) = 5\cos(\pi t) + \sin(5\pi t)$ $-\infty < t < \infty$	P = 13 w
3.	$x(t) = e^{jt\alpha}\cos(\omega t)$	P = 0.5 w
4.	$x(t) = (1+e^{-5t})u(t)$	P = 0.5 w

IV). Sketch the following signals.

1.	$x(t) = u(t+1) - 2u(t) + u(t-1)$
2.	$x(t) = u(t-2)\, r(t-1)$
3.	$x(t) = -u(t) + u(2+t)$
4.	$x(t) = r(t+2) - r(t+1) - r(t-1) + r(t-2)$
5.	$x(t) = 2u(t) - 1$

Problem 5

Determine if the following systems are time-invariant, linear, causal, and/or memory less?

S.No.	*Problem*	*Answer*
1.	dy /dt + 6y(t)=4x(t)	Linear, time invariant ,causal, memory
2.	dy/dt +4t y(t)=2x(t)	Linear, time variant ,causal, memory
3.	y(t) = dx/dt + x(t)	Linear, time invariant ,causal, memory
4.	dy/dt +sin(t)y(t)=4x(t)	Linear, time variant ,causal, memory

Problem 6

The response of an LTI system to a step input, x (t) = u (t) is y (t) = $(1-e^{-2t})$ u (t). What is the response to an input of x(t) = 4u(t)-4u(t-1)?

Problem 7

Consider the continuous time signal x (t) = 3-t $0 \leq t \leq 3$
0 otherwise sketch and label carefully x(3-2t)

Problem 8

A continuous-time signal $x(t)$ is shown in Fig. 1-17. Sketch and label each of the following signals.

(*a*) $x(t-2)$; (*b*) $x(2t)$; (*c*) $x(t/2)$; (*d*) $x(-t)$

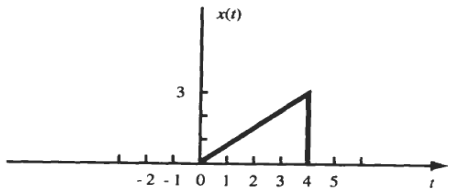

Fig. 1-17

Problem 9

A continuous-time signal $x(t)$ is shown in Fig. 1-27. Sketch and label each of the following signals.

(*a*) $x(t)u(1-t)$; (*b*) $x(t)[u(t)-u(t-1)]$; (*c*) $x(t)\delta(t-\frac{3}{2})$

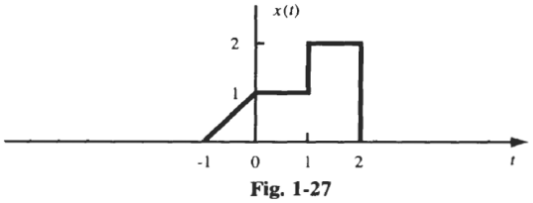

Fig. 1-27

Problem 10

Evaluate the following integrals:

$$(a) \quad \int_{-1}^{1} (3t^2 + 1)\delta(t)\, dt$$

$$(b) \quad \int_{1}^{2} (3t^2 + 1)\delta(t)\, dt$$

$$(c) \quad \int_{-\infty}^{\infty} (t^2 + \cos \pi t)\, \delta(t - 1)\, dt$$

$$(d) \quad \int_{-\infty}^{\infty} e^{-t}\delta(2t - 2)\, dt$$

Problem 11

Evaluate $y(t) = x(t) * h(t)$, where $x(t)$ and $h(t)$ are shown in Fig. 2-6, (a) by an analytical technique, and (b) by a graphical method.

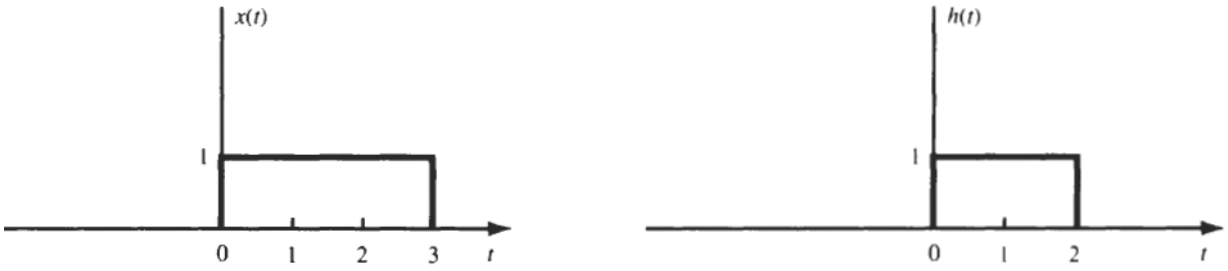

Fig. 2-6