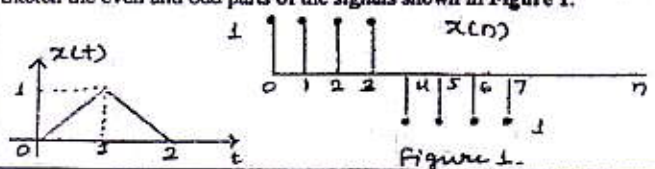
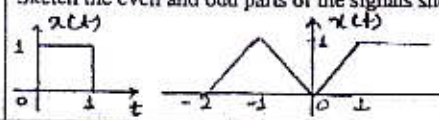
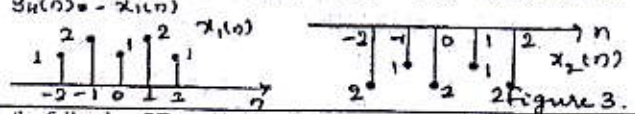
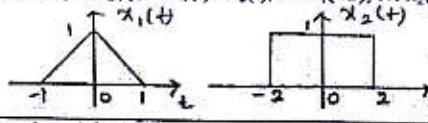
	SJPN Trust's **Hirasugar Institute of Technology, Nidasoshi.** *Inculcating Values, Promoting Prosperity* Approved by AICTE, Recognized by Govt. of Karnataka and Affiliated to VTU Belagavi.	ECE Dept Exam. IA I Even Sem (2017-18)

FIRST INTERNAL ASSESSMENT		
Sem :IV	Sub: Signal & Systems	Sub. Code: 15EC44
Date:06/03/2018	Time:03:00PM-04.00PM	Max. Marks: 25

Note: Answer two full questions, draw sketches wherever necessary.

Q. No		Discription of Question	Marks	CO	RBT LEVEL
1	a	Sketch the even and odd parts of the signals shown in Figure 1.  Figure 1.	6	C212.1	L1,L2
	b	Determine whether the following signal is periodic or not, if periodic find the fundamental period. $x(t) = \cos(5\pi t) + \sin(6\pi t)$ $x(n) = 5\sin(7\pi n/12) + 8\cos(14\pi n/8)$	6	C212.1	L1,L2
		OR			
2	a	Sketch the even and odd parts of the signals shown in Figure 2.  Figure 2.	6	C212.1	L1,L2
	b	Determine whether the following signal is energy or power signal and calculate its energy and power. i. $x(t) = \text{rect}(t)\cos(4\pi t)$	6	C212.1	L1,L2
3	a	Given the signal x(n) as shown in Figure 3.Sketch the following. i. $y_1(n)=x_1(n)+x_2(n)$, ii. $y_2(n)=2\,x_1(n)$, iii. $y_3(n)=x_1(n).\,x_2(n)$, iv. $y_4(n)=-x_1(n)$  Figure 3.	7	C212.1	L1,L2
	b	For the following CT system, determine wheather the system is Linear, Time-invarient, Static, Causal and Stable. $y(t) = x^2(t)$.	6	C212.1	L1,L2
		OR			
4	a	The signal $x_1(t)$ and $x_2(t)$ are shown in Figure 4. Sketch the following signals. i. $x_1(t) + x_2(t)$, ii. $x_1(t) \cdot x_2(t)$, iii. $x_1(t/2)$, iv. $x_2(2t)$, v. $-x_1(t)$.  Figure 4.	7	C212.1	L1,L2
	b	Define and explain elementary CT signals (any six) with waveform.	6	C212.1	L1,L2

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SCHEME OF EVALUATION

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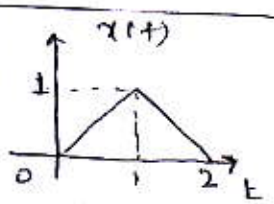
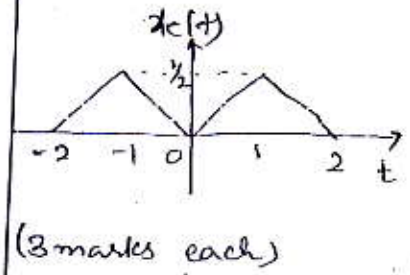
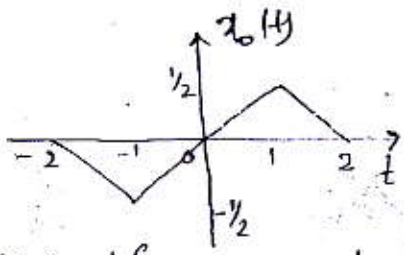
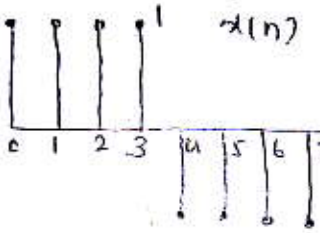
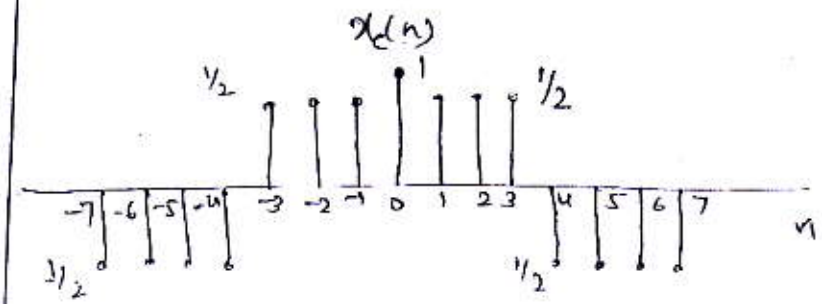
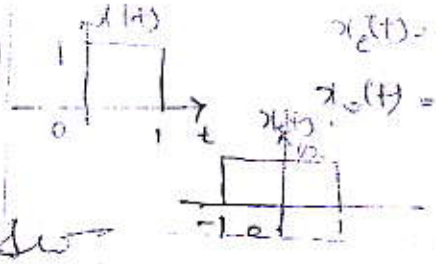
Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
1	(a)	 $x_e(t) = \frac{1}{2}\{x(t) + x(-t)\}$ $x_o(t) = \frac{1}{2}\{x(t) - x(-t)\}$   (3 marks each)  $x_e(n) = \frac{1}{2}\{x(n) + x(-n)\}$ $x_o(n) = \frac{1}{2}\{x(n) - x(-n)\}$ 	6	C212.1	L1, L2
1	(b)	$x(t) = \cos(5\pi t) + \sin(6\pi t)$ $T_1 = 2/5$, $T_2 = 1/3$, Periodic & $T = 2$. $x(n) = 5\sin(7\pi n/12) + 8\cos(14\pi n/8)$ $N_1 = 24$, $N_2 = 5$, $N = L = 24$	6	C212.1	L1, L2
2	(a)	 $x_e(t) = \frac{1}{2}\{x(t) + x(-t)\}$ $x_o(t) = \frac{1}{2}\{x(t) - x(-t)\}$	6	C212.1	L1, L2

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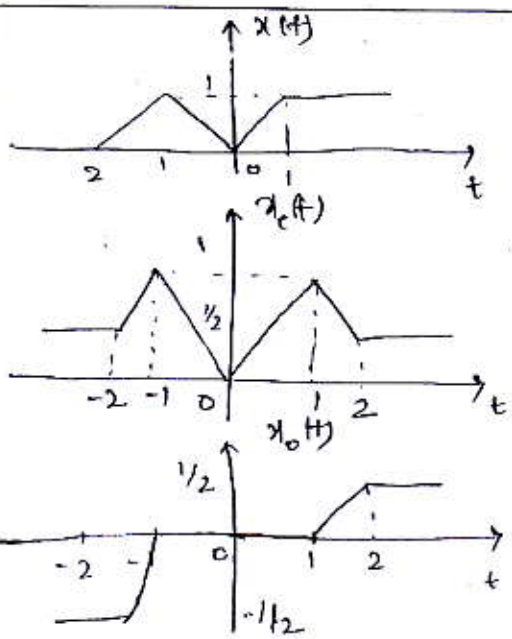
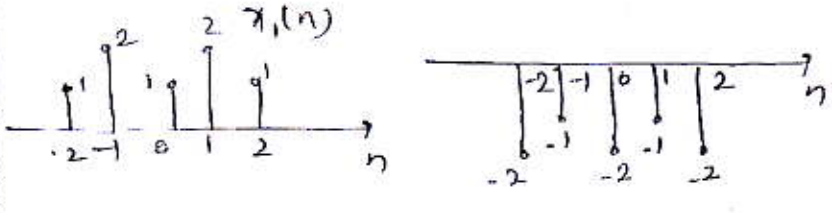
Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
2	(a)	 (3M each)	06	C212.1	L1, L2
2	(b)	$x(t) = \text{rect}(t)\cos(4\pi t)$ Energy $E = \int_{-\infty}^{\infty} \lvert x(t)\rvert^2 dt$ $= \frac{1}{2}\int_{-1/2}^{1/2} [1 + \cos(8\pi t)]\, dt = \frac{1}{2}$ It is an energy signal.	06	C212.1	L1, L2
3	(a)	 i) $y_1(n) = x_1(n) + x_2(n)$ (2M)	7	C212.1	L1, L2

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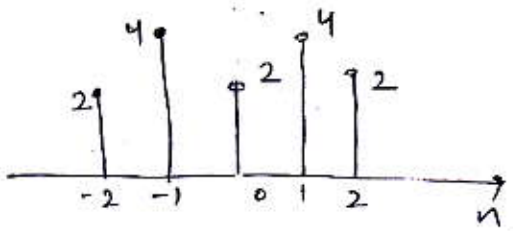
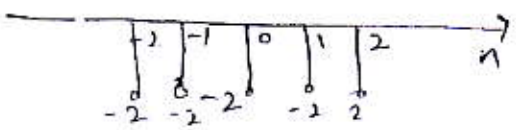
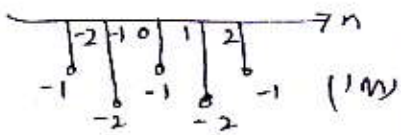
Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
3	(a)	(ii) $y_2(n) = 2x_1(n)$  (2M)	7M	(2) 2.1	L1, L2
		(iii) $y_3(n) = x_1(n) \cdot x_2(n)$  (2M)			
		(iv) $y_4(n) = -x_1(n)$  (1M)			
3	(b)	$y(t) = x^2(t)$ $y(t) = T\{x(t)\} = x^2(t)$ $T\{a x_1(t) + b x_2(t)\} = [a x_1(t) + b x_2(t)]^2$ $\neq a T\{x_1(t)\} + b T\{x_2(t)\}$ (2M) ∴ Non linear $T\{x(t-t_0)\} = x\{(t-t_0)\}$ $y(t-t_0) = x^2(t-t_0)$ $y(t-t_0) = T\{x(t-t_0)\}$ ∴ Time invariant (1M) $y(t)$ depends only on present input ∴ Static (0.5M) $y(t)$ doesn't depend on the future values of input ∴ Causal. (1M) $\|x(t)\| \leq B_x < \infty, \|y(t)\| \leq \|x^2(t)\| \leq B_y < \infty$ ∴ Stable (1M)	6M	(2)2.1	L1, L2

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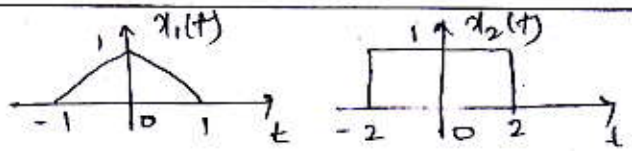
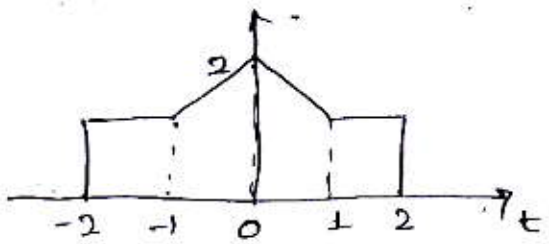
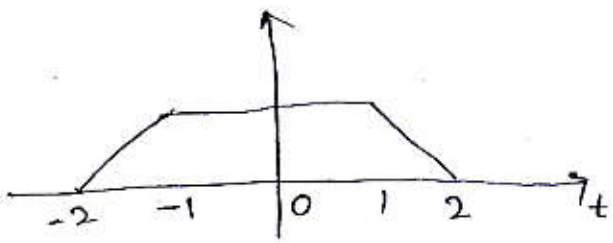
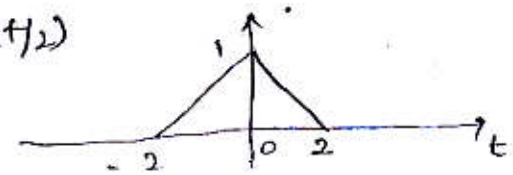
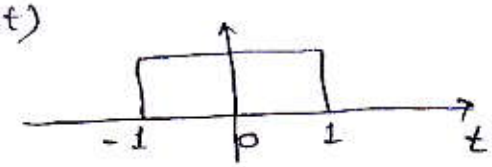
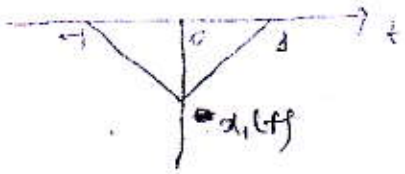
Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
4	(a)		7	(212.1)	L4, L2
		(i) $x_1(t) + x_2(t)$  (2M)			
		(ii) $x_1(t) \cdot x_2(t)$  (2M)			
		(iii) $x_1(t/2)$  (1M)			
		(iv) $x_2(2t)$  (1M)			
		(v) $-x_1(t)$  (1M)			

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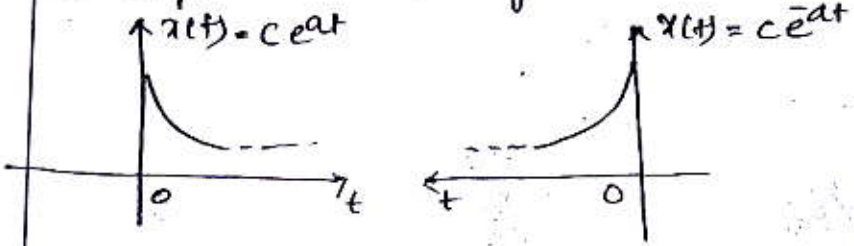
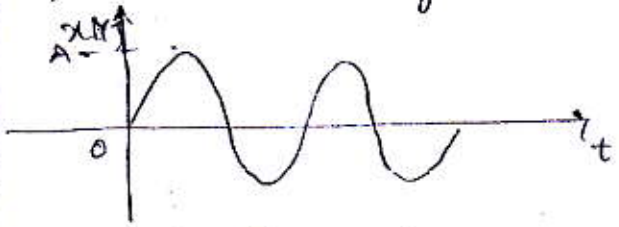
Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
4	(b)	Elementary continous time signals are	06	C212.1	L1

(i) Exponential signal

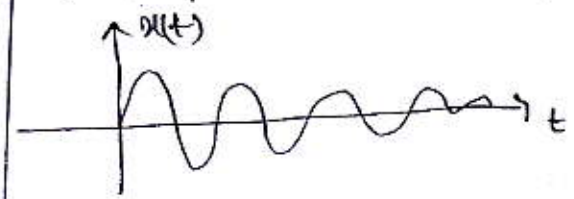


(ii) Sinusoidal signal



$x(t) = A \sin(\omega t + \phi)$

(iii) Exponential damped

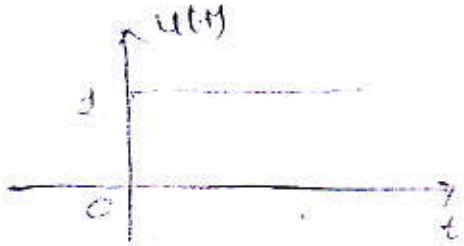


(iv) Unit step signal

$u(t) = 1 \quad ; \quad t > 0$

$= 0 \quad ; \quad t < 0$

(1M each)



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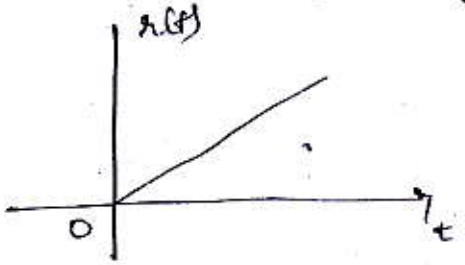
(v) Unit Ramp signal



$r(t) = t \quad ; \quad t > 0$

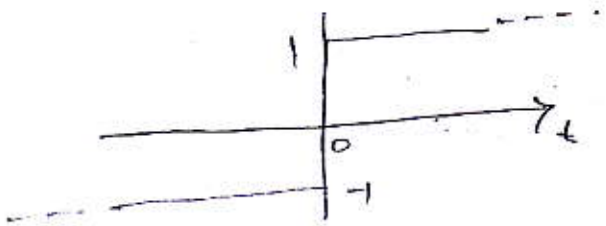
$= 0 \quad ; \quad t < 0$

(vi) Signum function

$sgn(t) = 1 \quad ; \quad t > 0$

$= 0 \quad ; \quad t = 0$

$= -1 \quad ; \quad t < 0$



(vii) Unit Impulse signal

$\delta(t) = 0 \quad ; \quad t > 0$

$\int_{-\infty}^{\infty} \delta(t)\, dt = 1$

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