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Inculcating Values, Promoting Prosperity

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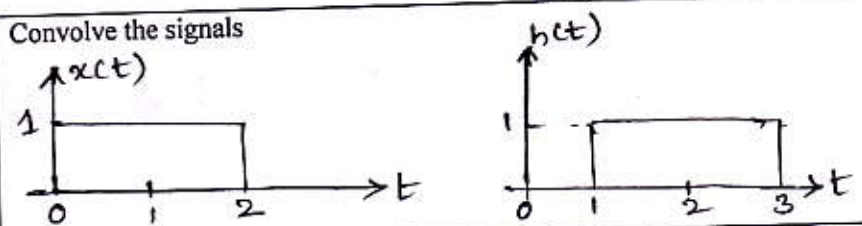
ECE Dept.
Exam.
Internal Assessment
Even Sem(2017-18)

SECOND INTERNAL ASSESSMENT

Sem :IV	Sub: Signals and Systems	Sub. Code: 15EC44
Date:12/04/2018	Time: 3:00PM-4.00PM	Max. Marks: 25

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

Q. No		Discription of Question	Marks	CO	RBT LEVEL
1.	a.	Prove convolution sum for discrete_time LTI system	6	CO212. 2	L2
	b.	Find the convolution by linearity and time shift metod for $x(n) = \{1, 2, -1, 1\}$ $h(n) = \{1, 0, 1\}$	6	CO212. 2	L2
		OR			
2.	a.	Evaluate discrete_time convolution sum of $y(n) = (1/2)^n u(n-2) * u(n)$	6	CO212. 2	L2
	b.	Prove the following i) $x(t) * \delta(t) = x(t)$ ii) $\delta(t-to) * x(t) = x(t-to)$	6	CO212. 2	L2
3.	a.	Convolve the signals $x(n) = u(n) - u(n-8)$ and $h(n) = u(n) - u(n-5)$	8	CO212. 2	L3
	b.	Prove the distributive property of convolution intergral	5	CO212. 2	L2
		OR			
4.	a.	Convolve the signals 	8	CO212. 2	L3
	b.	Prove the associative property of convolution sum	5	CO212. 2	L2

Course Coordinator

Module Coordinator

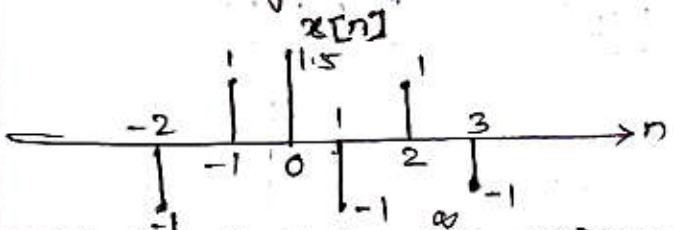
HOD

SCHEME OF EVALUATION IA- II

Sem : 4 | Subject : S&S | Sub Code : 15EC44 | Date : 12-04-18

Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
1.	a.	Proof of Convolution Sum.			

Consider a general signal.



The signal $x[n] = \sum_{k=-\infty}^{\infty} x(k)\,\delta(n-k)$.

$y(n)$ = $x(n)$'s function.

$x(n) \rightarrow [\,h(n)\,] \rightarrow y(n) = H\{x(n)\}$.

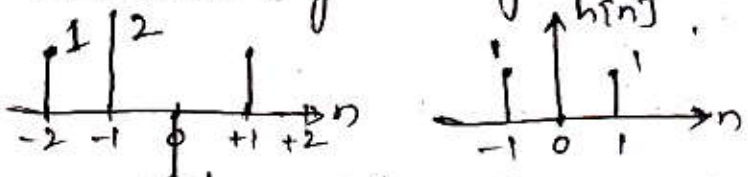
$$y(n) = H\left\{\sum_{k=-\infty}^{\infty} x(k)\,\delta(n-k)\right\}$$

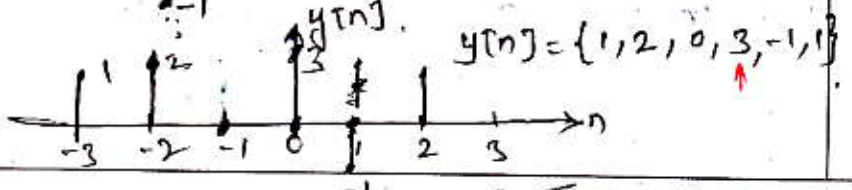
$$= \sum_{k=-\infty}^{\infty} x(k)\,H\{\delta(n-k)\}$$

$$= \sum_{k=-\infty}^{\infty} x(k)\,h(n-k) = x(n)*h(n)$$

6 | CO2, 2 | L2

1.	b.	Convolution by linearity and time-shift.			





$y[n] = \{1, 2, 0, 3, -1, 1\}$

6 | CO2, 2 | L2

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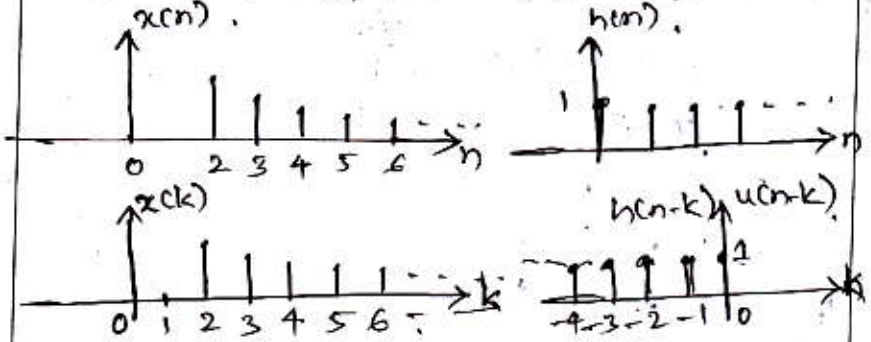
SCHEME OF EVALUATION IA-II

Sem : 4 | Subject : Signals and Systems | Sub Code : 15EC46 | Date : 12-04-18

Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
2	a.	$y(n) = (1/2)^n u(n-2) * u(n)$	6	CO212.2	L2



$y(n) = 0 \quad ; n<2$

$$y(n) = \sum_{k=2}^{n} (1/2)^k \underbrace{u(k-2)}_{1.} \underbrace{u(n-k)}_{1.}$$

$$= \sum_{k=2}^{n} (1/2)^k = \sum_{m=0}^{n-2} (1/2)^{m+2} = \frac{1-(1/2)^{n-1}}{1-1/2} \times 2^2$$

$$= 8\left(1-(1/2)^{n-1}\right)$$

b. Proof of

i) $x(t) * \delta(t) = x(t)$

$$\int_{-\infty}^{\infty} x(\tau)\,\delta(t-\tau)\,d\tau = \int_{-\infty}^{\infty} \delta(\tau)\,x(t-\tau)\,d\tau$$

$\delta(t) = 1 \quad t=0$. $\qquad \delta(\tau)=1$ at $\tau=0$

$= x(t)$.

ii) $\delta(t-t_0) * x(t) = x(t-t_0)$.

$$\int_{-\infty}^{\infty} \delta(\tau-t_0)\,x(t-\tau)\,d\tau = \int_{-\infty}^{\infty} \delta(\tau-t_0)\,x(t-\tau)\,d\tau$$

$= x(t-t_0)$ $\qquad = \quad t=t_0$.

6 | CO212.2 | L2

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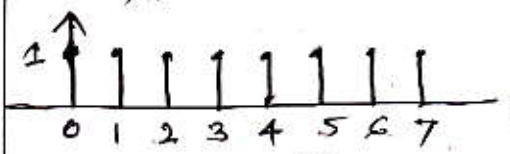
SCHEME OF EVALUATION IA-II

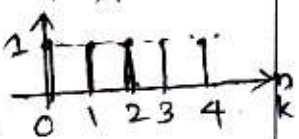
Sem : 4 | Subject : Signals and Systems | Sub Code : 15EC46 | Date : 12/4/18

Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
3	a.	Convolve Signals $x(n) = u(n) - u(n-8)$ and $h(n) = u(n) - u(n-5)$	8	CO2,12,2	L3

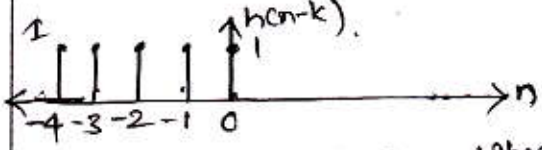
$x(n) = x(k)$.



$h(n)$.



$h(n-k)$.



$y(n) = 0$; $n < 0$.

When $0 \le n \le 4$

$$y(n) = \sum_{k=0}^{n} 1 = n+1$$

$4 \le n \le 7$

$$y(n) = \sum_{k=n-4}^{n} 1. = n - n + 4 + 1 = 5$$

$7 < n \le 11$ $\quad y(n) = \sum_{k=n-4}^{7} 1.1 = 7 - n + 4 + 1$

$= 12 - n$

b. $x(t) * \{h_1(t) + h_2(t)\} = x(t) * h_1(t) + x(t) * h_2(t)$

$$\int_{-\infty}^{\infty} x(\tau) h_1(t-\tau)\, d\tau + \int_{-\infty}^{\infty} x(\tau) h_2(t-\tau)\, d\tau$$

$$= \int_{-\infty}^{\infty} x(\tau) \left[h_1(t-\tau) + h_2(t-\tau) \right] d\tau$$

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

$= x(t) * h(t) = x(t) * [h_1(t) + h_2(t)]$

5 | CO2,12,2 | L3

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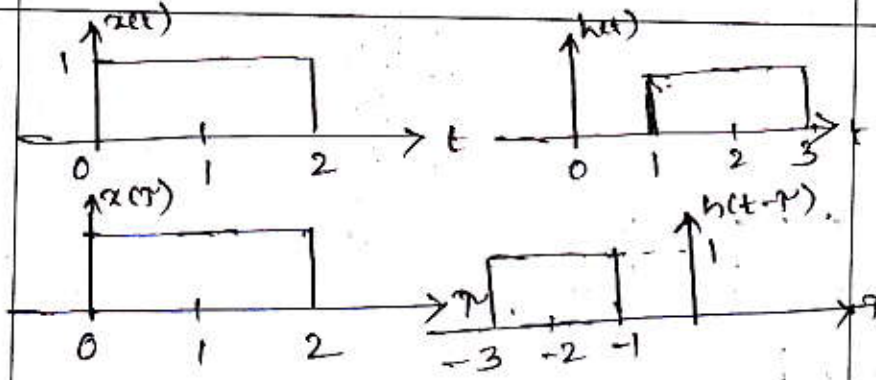
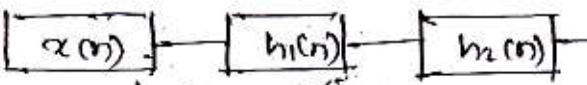
SCHEME OF EVALUATION IA- II

Sem : 4 | Subject : Signals and Systems | Sub Code : 15EC44 | Date : 12-04-18

Q. No.	Bit	Description	Marks	CO's	RBT LEVEL
4.	a.	 $y(t) = 0 ; \quad t < 1$ $1 \le t \le 3 \quad y(t) = \int_0^t 1.1.d\tau = t$ $3 \le t \le 5 \quad y(t) = \int_{t-3}^{2} 1.1.d\tau = \tau\Big\|_{t-3}^{2}$ $= 2 - t + 3 = -t + 5.$	8	CO212 2	L_3
	b.	Associative Property of Convolution sum $x(t) * \{h_1(n) * h_2(n)\} = \{x(n) * h_1(n)\} * h_2(n)$  $\sum_{k=-\infty}^{\infty} z(k)\, h_2(n-k) = y(n)$; $z(k) = x(k) * h_1(k)$ $\Rightarrow y(n) = \sum_{k=-\infty}^{\infty} \sum_{\eta=-\infty}^{\infty} x(\eta)\, h_1(k-\eta)\, h_2(n-k)$ put $m = k - \eta$ $= \sum_{m=-\infty}^{\infty} \sum_{\eta=-\infty}^{\infty} x(\eta)\, h_1(m)\, h_2(n-(m-\eta))$ $= x(n) * \{h_1(n) * h_2(n)\}$	5	CO2122	L_2

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