Code: 20EC3303, 20EE3302

II B.Tech - I Semester – Regular / Supplementary Examinations DECEMBER 2022

SIGNALS AND SYSTEMS

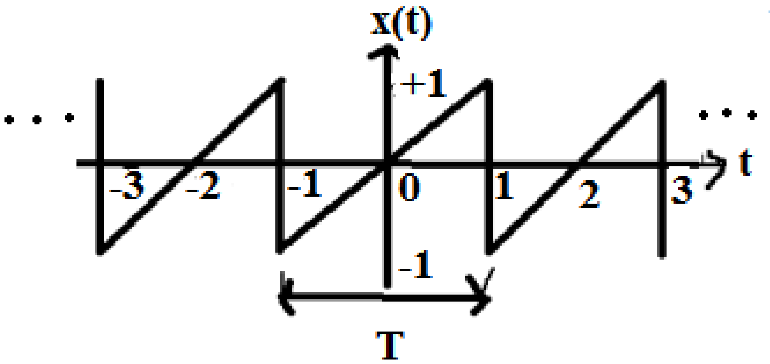
(Common for ECE, EEE)

Duration: 3 hours Max. Marks: 70

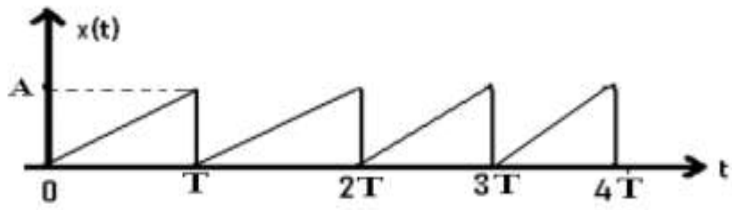
Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
		UNIT-I			
1	a)	i) Define and sketch the following elementary continuous time signals. Unit impulse signal; Signum function; unit step function. ii) Evaluate the following integrals $\int_{-\infty}^{\infty} \delta(t) \sin 2\pi t \, dt$; $\int_{-\infty}^{\infty} [\delta(t) \cos t + \delta(t-1) sint] dt$	L2	CO1	7 M
	b)	Determine the power and rms value of the signal x(t)= u(t).	L2	CO1	7 M
		OR			
2	a)	If $x(t) = r(t) - r(t-1) - r(t-2) + r(t-3)$, then draw the signal, $y(t) = x(-t+1)$.	L2	CO1	7 M
	b)	Define i) Signal ii) System; classify systems with examples.	L2	CO1	7 M

UNIT-II					
3	a)	Determine whether the following continuous-time system is Memory less, Time invariant, Linear, Causal and Stable $y(t) = x(t - 2) + x(2 - t)$	L3	CO1 CO2	7 M
	b)	Let $x(t) = u(t-3) - u(t-5)$ and $h(t) = e^{-3t} u(t)$. Compute $y(t) = x(t) * h(t)$.	L3	CO1 CO2	7 M
OR					
4	a)	Compute and plot $y[n] = x[n] * h[n]$, where $x[n] = \begin{cases} 1\ ;\ 3 \le n \le 8 \\ 0\ ;\ \text{otherwise} \end{cases}$ and $h[n] = \begin{cases} 1\ ;\ 4 \le n \le 6 \\ 0\ ;\ \text{otherwise} \end{cases}$	L3	CO1 CO2	7 M
	b)	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 $x(t) = 4u(t) - 4u(t-1)$?	L3	CO1 CO2	7 M
UNIT-III					
5	a)	Find the trigonometric Fourier series for the periodic signal x(t) shown below 	L3	CO1 CO3	7 M

	b)	Find the complex exponential Fourier series coefficients of the signal $x(t) = \sin 3\pi t + 2 \cos 4\pi t$	L3	CO1 CO3	7 M
OR					
6	a)	Obtain the Fourier transform of a periodic train of impulses with period T.	L3	CO3	7 M
	b)	Find the Fourier transform of $x(t) = u(2t)$, where $u(t)$ is the unit step function.	L3	CO3	7 M
UNIT-IV					
7	a)	The Fourier transform of a discrete-time signal is $X(e^{j\omega}) = 1 + 3e^{-j\omega} + 2e^{-j2\omega} - 4e^{-j3\omega} + e^{-j10\omega}$ Determine the signal $x[n]$.	L3	CO2 CO4	7 M
	b)	State and Prove the following properties of Discrete Time Fourier Transform i) First Difference ii) Time Shifting iii) Time Convolution	L3	CO2 CO4	7 M
OR					
8	a)	Consider a discrete-time LTI system with impulse response $h[n] = (½)^n u[n]$. Use Fourier transforms to determine the response to the following input signal $x[n] = (3/4)^n u[n]$.	L4	CO2 CO4	7 M
	b)	Let $x[n]$ and $h[n]$ be signals with the following Fourier transforms $X(e^{j\omega}) = 3e^{j\omega} + 1 - e^{-j\omega} + 2e^{-j3\omega}$; $H(e^{j\omega}) = -e^{j\omega} + 2e^{-2j\omega} + e^{j4\omega}$ Determine $y[n] = x[n] * h[n]$	L4	CO2 CO4	7 M

UNIT-V					
9	a)	State and Prove the following properties of Laplace Transform i) Time Shifting ii) Shifting in the s-Domain iii) Time Scaling	L3	CO2 CO5	7 M
	b)	Find out the Laplace transform of the signal shown in below figure. 	L4	CO2 CO5	7 M
OR					
10	a)	Find the all possible sequences with Z-Transform given by $X(z) = \dfrac{1-\frac{1}{2}z^{-1}}{1+\frac{3}{4}z^{-1}+\frac{1}{8}z^{-2}}$	L4	CO2 CO5	7 M
	b)	Find the Z-Transform of $x_1(n)= n.u(n)$; $x_2(n)= (n-3).u(n-3)$; $x_3(n)= (n-3).u(n)$	L4	CO2 CO5	7 M