CBCS SCHEME

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BMT306B

Third Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.2025
Signals and Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is signal and system? Explain continuous time and discrete time signals with examples.	10	L2	CO1
	b.	Develop the even/odd decomposition of a general signal $x(t) = x_e(t) + x_o(t)$.	10	L3	CO1
		OR			
Q.2	a.	Explain with necessary equation different types of operations performed on dependent variables.	10	L2	CO1
	b.	Consider a discrete-time system described by the input-output relation $y(n) = nx(n)$. Show that this system is linear.	10	L3	CO1
		Module – 2			
Q.3	a.	A LTI system has impulse response given by $h(n) = un - u(n-10)$. Determine the output of the system when the input is rectangular pulse defined as $x(n) = u(n-2) - u(n-7)$.	10	L3	CO2
	b.	Explain in detail how convolution integral can be used to determine the output of a continuous time LTI system.	10	L2	CO2
		OR			
Q.4	a.	Suppose the input $x(t) = 2u(t-1) - 2u(t-3)$ and impulse response $h(t) = u(t+1) - 2u(t-1) + u(t-3)$ of a LTI system. Determine the output of this system.	10	L3	CO2
	b.	Explain in detail how convolution sum can be used to determine the output of a discrete-time system.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain the commutative property possessed by a LTI system with necessary equation.	10	L2	CO3
	b.	What is step response? Find the step response of the RC circuit having impulse response: $h(t) = \frac{1}{RC} e^{-t/RC} u(t)$	10	L3	CO3
		OR			
Q.6	a.	Explain the natural response and forced response of a system with necessary equation.	10	L2	CO3
	b.	Obtain the block diagram description in direct form I and direct form II for the following equation: $y(n) + \frac{1}{2}y(n-1) - \frac{1}{3}y(n-3) = x(n) + 2x(n-2)$.	10	L3	CO3
		Module – 4			
Q.7	a.	Explain the relationship between time properties of a signal and the appropriate Fourier representation.	10	L2	CO4
	b.	What is Discrete Time Fourier Series (DTFS)? Find the DTFS representation for $x(n) = \cos\left(\frac{\pi}{8}n + \phi\right)$.	10	L2	CO4

		OR			
Q.8	**a.**	What is Continuous Time Fourier Series (FS) with necessary equation?	**10**	**L2**	**CO4**
	b.	Determine the Fourier series representation for the signal $x(t) = 3\cos\left(\frac{\pi}{2}t + \frac{\pi}{4}\right)$	**10**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Give the DTFT representation and obtain the DTFT of a exponential signal $x(n) = \alpha^n u(n)$.	**10**	**L3**	**CO5**
	b.	Find the inverse DTFT of $X(e^{j\theta}) = \begin{cases} 1 & \lvert\Omega\rvert \le \omega \\ 0 & \omega < \lvert\Omega\rvert < \pi \end{cases}$.	**10**	**L3**	**CO5**
		OR			
Q.10	**a.**	Give the Fourier Transform representation and obtain the Fourier Transform of $x(t) = e^{-at}u(t)$.	**10**	**L3**	**CO5**
	b.	Explain linearity properties and time shifting properties.	**10**	**L3**	**CO5**

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