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Examination: Odd Semester Examination 2024

Paper Name: Signals and Systems
Time: 2.5 Hours

Paper Code: BTECE-303/ BTECE-303 LE
Maximum Marks: 60

Section A

Note: Attempt all the questions. Each question carries equal marks.

(4x5=20)

Q.No.	Question	Marks	CO	BL
1.	Determine whether the following signals are power or energy signal or neither: (a) $x(t) = e^{-at}$; $a > 0$ and (b) $x(n) = (1/3)^n u(n)$.	5	CO1	BL4
2.	Explain any four properties of Continuous Time Fourier Transform (CTFT).	5	CO2	BL2
3.	Evaluate DTFT of the following signals: (a) $x_1 = (1/2)^n \cdot u(n)$ (b) $x_2 = a^{ n }$, $ a < 1$	5	CO3	BL5
4.	Evaluate Z-transform of $n \cdot a^n u(n)$ and also plot its ROC.	5	CO5	BL5

Section B

Note: Attempt any four (4) Questions

(4x10=40)

Q.No.	Question	Marks	CO	BL
1.	Evaluate convolution of $x(t) = e^{-at} \cdot u(t)$ and $h(t) = u(t)$.	10	CO2	BL5
2.	The systems that follow have input $x(t)$ and output $y(t)$. Analyse whether it is (i) memoryless (ii) stable (iii) causal (iv) linear and (v) time invariant. (a) $y(t) = x(t-1) + 2\{x(t)\}^2$ (b) $y(t) = x(t^2)$	10	CO1	BL4
3.	A causal and LTI system S has the frequency response	10	CO3	BL6

	$H(\omega) = \frac{4 + j\omega}{6 - \omega^2 + 5j\omega}$ (a) Determine a differential equation relating the input $x(t)$ and output $y(t)$ of S. (b) Determine impulse response $h(t)$ of S. (c) What is the output of S when the input is (a) $x(t) = e^{-4t} \cdot u(t) - t \cdot e^{-4t} \cdot u(t)$			
4.	Determine Laplace transform of the following signals: (a) $x(t) = \cos(\omega_0 t) \cdot u(t)$ (b) $x(t) = \sin(\omega_0 t) \cdot u(t)$	10	CO4	BL5
5.	Describe properties of Z-transform. Also discuss its Region of Convergence (ROC).	10	CO5	BL2
6.	Write a short note on any two of the followings: a. Convergence of Fourier transform b. Even and Odd signals c. Periodic and aperiodic signals d. ROC of Laplace transform	10	CO1, CO2, CO4	BL1

BL: Blooms Taxonomy Level; (1-remembering, 2-understanding, 3-apply, 4-analyse, 5-evaluate, 6- create)