BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION MO/2024)

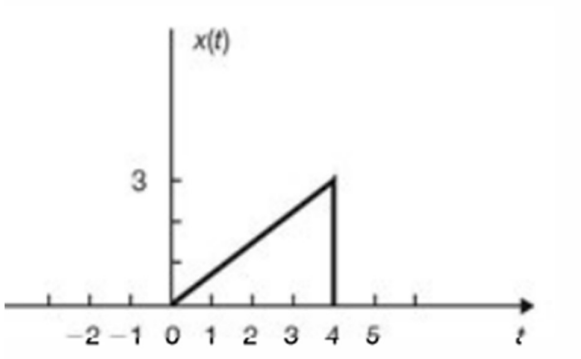
CLASS: BTECH **SEMESTER : VII**
BRANCH: CSE **SESSION : MO/2024**

SUBJECT: EC437R1 INTRODUCTION TO SIGNAL PROCESSING

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	A continuous-time signal $x(t)$ is given below. Sketch (i) $x(t-2)$ (ii) $x(2t)$ (iii) $x(t/2)$ (iv) $x(-t)$.	[2]	CO1	VI



Q.1(b)	If $x(t) = \delta(t+1) - \delta(t-3)$, find the energy in $y(t) = \int_{-\infty}^{t} x(\tau)\, d\tau$.	[3]	CO1	V
Q.2(a)	Find the time period of (i) $x(t) = e^{\frac{j5\pi t}{6}} + e^{\frac{j\pi t}{3}}$ (ii) $x(t) = \sin\left(\frac{2\pi t}{3}\right).\cos\left(\frac{4\pi t}{5}\right)$	[3]	CO2	IV
Q.2(b)	What is a distortion less LTI system?	[2]	CO2	IV
Q.3(a)	Find the Fourier transform of $x(t) = e^{-\lvert t\rvert}$, $a > 0$. Sketch its magnitude and phase spectra.	[2]	CO2	IV
Q.3(b)	State and prove time scaling and time shifting property of Fourier transform	[3]	CO2	II
Q.4(a)	What are the advantages of Laplace transform over Fourier transform?	[2]	CO2	II
Q.4(b)	Find the Laplace transform of (i) $x_1(t) = e^{-at}\, u(t), a > 0$ (ii) $x_2(t) = -e^{-at}\, u(-t), a > 0$. Sketch the ROC of $x_1(t)$ and $x_2(t)$.	[3]	CO2	IV
Q.5(a)	Explain the importance of Eigen functions of an LTI system.	[2]	CO1	II
Q.5(b)	Consider a discrete-time system with the input and output relation $y[n] = T\{x[n]\} = x^2[n]$. Determine whether this system is (i) Linear (ii) time-invariant	[3]	CO1	III

::::::27/09/2024::::::M