BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

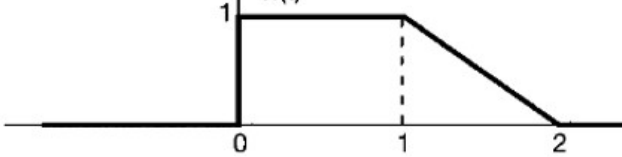
CLASS: BTech — **SEMESTER : IV/ADD**
BRANCH: ECE — **SESSION : SP/2025**

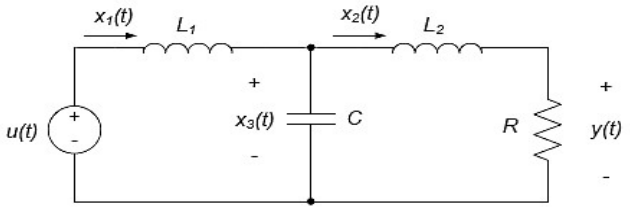
SUBJECT: EC251 SIGNAL AND SYSTEMS

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)	Define energy vs power signal. Find the energy of the signal $x(n) = \left(\frac{1}{2}\right)^n u(n)$.	[2]	CO1	1
Q.1(b)	If x_1 (t) and x_2 (t) be periodic signals with fundamental periods T1, and T2 respectively; find the condition that the sum of x_1 (t) and x_2 (t) be periodic. Determine the period of the signal $x(n) = 1 + e^{\frac{4\pi}{7}n} - e^{\frac{2\pi}{5}n}$	[3]	CO1	3
Q.2(a)	Show that the given input – output relation is BIBO stable. y[n] = 1/3 (x[n] + x[n-1] + x[n-2])	[2]	CO1	2
Q.2(b)	Sketch the signal $x\left(\frac{3}{2}t + 1\right)$; x(t) is shown in Figure below.	[3]	CO1	3
Q.3(a)	Comment on the linearity and time-invariance of the system defined as: $y(n) = x(kn) + 3$	[2]	CO1	3
Q.3(b)	Determine the output of the system h(n)= {1, 2,1, -1} when the input is provided as x(n)= {1, 2, 3, 1}.	[3]	CO2	2
Q.4(a)	Derive the condition of impulse response for the causality of an LTI system.	[2]	CO2	2
Q.4(b)	The step response of a discrete time LTI system is given as: $s[n] = a^n u(n), 0 < a < 1$. Compute the impulse response h[n] of the system.	[3]	CO2	3
Q.5(a)	Define the state and state space representation of a system.	[2]	CO1	1
Q.5(b)	Find the state transition matrix of the following electrical system.	[3]	CO2	3





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