

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

CLASS: BTECH
BRANCH: ECE

SEMESTER : IV/ADD
SESSION : SP/2025

SUBJECT: EC253R2 ANALOG COMMUNICATION

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
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Q.1(a)	(a) Identify the Power signal and energy signal from the following: i. $x(t) = Ae^{-\alpha t}u(t)$ where $\alpha > 0$ ii. $x(t) = \cos 2\pi f_0 t$ iii. $x(t) = tu(t)$ iv. $x(t) = Ae^{j\omega_0 t}$	[2]	CO CO1	BL 2
Q.1(b)	Calculate the Energy spectral density of a gate function of width 6 unit and amplitude 2 unit at $\omega = \pi/6$.	[3]	CO1	3
Q.2(a)	State and prove the time shifting property of the Fourier Transform.	[2]	CO1	2
Q.2(b)	Find Fourier transform of a pulse $g(t) = Arect\left(\frac{t-t_0}{\tau}\right)$. Draw its amplitude and Phase spectrum.	[3]	CO1	3
Q.3(a)	What is Distortion-less Transmission? What are the requirements for distortion-less transmission?	[2]	CO1	2
Q.3(b)	Consider the signal given by $X(t) = \cos(2\pi 100t) + \sqrt{3}\sin(2\pi 100t)$, the pre-envelope, $X_+(t)$, complex envelope $\tilde{X}(t)$ and natural envelope $a(t)$ of the signal.	[3]	CO1	4
Q.4(a)	Discuss the limitations of Amplitude modulation.	[2]	CO2	2
Q.4(b)	An antenna has an impedance of 40 Ω . An unmodulated AM signal produces a current of 4.8 A. The modulation is 90 percent. Calculate (a) the carrier power, (b) the total power, and (c) the sideband power.	[3]	CO2	3
Q.5(a)	What are the advantages of Single side band modulation over amplitude modulation?	[2]	CO2	2
Q.5(b)	An SSB transmitter operates at a frequency of 4.2 MHz The voice frequency range is 300 to 3400 Hz. Calculate the upper and lower sideband ranges. What should be the approximate centre frequency of a bandpass filter to select the lower sideband?	[3]	CO2	4

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