Code No.: R22EC304PC	R22	H.T.No.			8	R						

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
II–B.TECH–I–Semester End Examinations (Regular) - December- 2025
SIGNALS AND SYSTEMS
(ECE)

[Time: 3 Hours] **[Max. Marks: 60]**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 10 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A **(10 Marks)**

1. a)	Define even signal and odd signal with example.	[1M]
b)	Sketch the waveform of y(t) = r(t -5).	[1M]
c)	State Dirichlet's conditions for existence of Fourier transform.	[1M]
d)	State and prove linearity property of Fourier transform.	[1M]
e)	Define signal bandwidth and system bandwidth.	[1M]
f)	What is the system transfer function of LTI systems?	[1M]
g)	Compare the stability with poles and zeros in the Laplace transform and Z-transform.	[1M]
h)	Obtain the Z-transform of x(n)=u(n-1).	[1M]
i)	Calculate the Nyquist's frequency of the signal x(t)=2cos(10Πt) + 15sin(800Πt).	[1M]
j)	Formulate Parsevals Theorem for Fourier series.	[1M]

PART-B **(50 Marks)**

2.a)	Explain the orthogonality between two signals $f_1(t)$ and $f_2(t)$ and derive the approximation coefficient C_{12}.	[5M]
b)	Show that the following signals $f_1(t) = sin(nwt)$ and $f_2(t) = cos(mwt)$ are orthogonal over an interval [0, 2π].	[5M]

OR

3.	Define Ramp signal and sketch the waveforms of y(t) = r(t + 1) - r(t) + r(t - 2).	[10M]
4.	Derive the trigonometric Fourier series coefficients a_0, a_n, b_n.	[10M]

OR

5.	State and prove any five properties of Fourier Transform.	[10M]
6.	Consider an LTI system with impulse response $h(t)=e^{-2t}U(t)$. Find the response of the system to an input signal x(t)=sin(3t)U(t).	[10M]

OR

7.	Find the convolution of two functions and represent them graphically. x(t) = 2 for -2≤t≤2 and h(t) = 4 for 0≤t≤2.	[10M]
8.	Find the inverse Laplace transforms of the function $H(s)= (s+1) / (s^2+3s+2)$.	[10M]

OR

9.	Using Scaling property determine the Z-transform of $x(n) = a^n \cos(wn)u(n)$ and find its ROC.	[10M]
10.	State and prove sampling theorem for band limited signal with suitable diagrams.	[10M]

OR

11.	Discuss the relationship between Autocorrelation Function and Power Spectral Density Function with mathematical expressions.	[10M]

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