

## CMR ENGINEERING COLLEGE: : HYDERABAD

## UGC AUTONOMOUS

## II-B.TECH-I-Semester End Examinations (Supply) - June- 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) Distinguish between time invariant and time varying systems. [1M]
- b) Express the formula for orthogonality between two vectors. [1M]
- c) What is Fourier Series? [1M]
- d) Write any two properties of Fourier transforms [1M]
- e) Write the condition for Paley-Wiener criterion. [1M]
- f) Write the expression for convolution. [1M]
- g) What is the region of convergence (ROC)? [1M]
- h) State initial value theorem and final value theorem of Laplace transform. [1M]
- i) Define sampling and sampling period. [1M]
- j) What is the relation between convolution and correlation? [1M]

**PART-B****(50 Marks)**

2. Check whether the following system is static or dynamic, linear or non- linear, causal or non- causal and Time invariant or time variant. [10M]

i)  $y(n)=Ax(n)+B$     ii)  $y(n)=n^2 x(2n)$

**OR**

- 3.a) A rectangular function  $f(t)$  is defined by [7M]

$$f(t) = \begin{cases} 1, & 0 < t < \pi \\ -1, & \pi < t < 2\pi \end{cases}$$

Approximate the above function by a wave form  $\sin(t)$  over the interval  $(0, 2\pi)$ , such that the mean square error is minimum.

- b) Briefly discuss about orthogonality in complex functions. [3M]
- 4.a) Drive the relation between trigonometric Fourier series and Exponential Fourier series. [5M]
- b) State and prove the Time shifting and Scaling properties of Fourier series [5M]

**OR**

5. Find the Fourier transform of the following signals [10M]
- (i)  $x(t)=e^{-3t}u(t)$     (ii)  $x(t)=te^{-at}u(t)$     (iii)  $x(t)=e^{-t}\sin 5t u(t)$     (iv)  $x(t)=e^{-t}\cos 5t u(t)$
6. Explain the ideal LP, HP, BP, BR Filter characteristics of linear systems explain with neat diagrams [10M]

**OR**

- 7.a) Consider a stable LTI system that is characterized by the differential equation [7M]
- $$d^2 y(t)/dt^2 + 4dy(t)/dt + 3y(t) = dx(t)/dt + 2x(t)$$
- find the impulse response.
- b) Write the properties of convolution. [3M]

8. State and prove the any five Properties Laplace Transform. [10M]

**OR**

9. Using the Properties of Z-transform. Find the Z-transform of following signals [10M]  
(i)  $x(n)=u(-n)$  (ii)  $x(n)=2^n u(n-2)$  (iii)  $2(3)^n u(-n)$  .

10.a) Draw the circuit to generate flat top samples and explain. Also obtain the expression [5M]  
for its spectrum.

b) Discuss in detail about bandpass sampling. [5M]

**OR**

11.a) State and prove the Parseval's theorem for energy signals in Fourier transform. [5M]

b) Explain the detection of periodic signals in the presence of noise by auto correlation. [5M]

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