

Roll No. ....

**3037**

**B. Tech. 3rd Semester (ECE)  
Examination – December, 2022**

**SIGNALS AND SYSTEMS**

Paper : PCC-ECE-209-G

*Time : Three Hours ] [ Maximum Marks : 75*

*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

**Note :** Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Explain the following : 2.5 × 6 = 15
- (a) Explain the condition for existence of Fourier Transform.
  - (b) Check  $x(t) = e^{-at}$  is periodic or Aperiodic.
  - (c) Differentiate the CTFT and DTFT.
  - (d) Discuss in brief the application of Z- Transform.

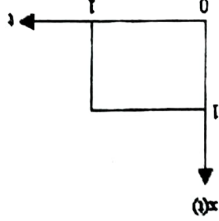
- (e) Explain the relationship between step, ramp and delta functions.  
 (f) Determine the relationship between Z- transform and DTFT.

### UNIT - I

2. Describe signal and its classification with example. 15

3. (a) A continuous time signal  $x(t)$  is shown in figure. Sketch and label each of following signal : 8

- (i)  $x(t - 2)$   
 (ii)  $-1x(t + 3)$   
 (iii)  $2x(-2t + 6)$



(b) Check whether the following systems are linear or non linear : 7

- (i)  $y(t) = tx(t)$   
 (ii)  $y(t) = x^2(t)$

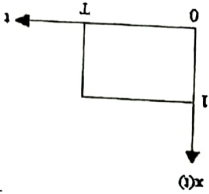
### UNIT - II

4. Explain the various properties of discrete-time Fourier Transform. 15

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(-P-4)(Q-9)(22) ( 2 )

5. (a) Determine the Fourier transform of a given rectangular pulse. 10



(b) Define the Commutative, Distributive and Associative property of LTI system. 5

### UNIT - III

6. Explain the various properties of Z-Transform. 15

7. (a) Determine the Laplace transform and ROC for the given signal  $x(t) = 3e^{-2t}u(t) - 2e^{-t}u(-t)$ . 8

(b) Determine the Z-transform of  $x(n) = \cos \omega_0 n$  for  $n \geq 0$ . 7

### UNIT - IV

8. The system is described by the second order differential equation 15

$$\ddot{y}(t) + a_1\dot{y}(t) + a_2y(t) = br(t)$$

Obtain :

- (i) State variable mode  
 (ii) State transition matrix  
 (iii) Transfer function of the system

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(-P-4)(Q-9)(22) ( 3 )

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9. (a) Analyze the different methods to obtain the state model. 10

(b) Define the state of the system. Explain state variable model. What are its advantages? 5

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-(P-4)(Q-9)(22) (4)