Roll No……..….. **Total No. of Printed Pages: [02]**
Total No. of Questions: [09]

B. Tech EE (Semester – 4th)
SIGNALS AND SYSTEMS
Subject Code: BELES1407
Paper ID: [18111518]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a. Define linearity in the context of systems.
b. Explain the concept of causality in systems.
c. Explain the concept of impulse response and its significance in characterizing the behavior of Linear Time-Invariant (LTI) systems.
d. Define convolution and discuss its role in determining the output of a system for a given input.
e. Discuss the concept of Fourier series representation for periodic signals.
f. Define Fourier Transform and explain the effect of convolution and multiplication in the frequency domain.
g. Define the Sampling Theorem and discuss its significance in signal processing.
h. Explain the concept of aliasing in the context of sampled signals.
i. Explain pole zero concept.
j. Define modulation for communication system.

Section – B **(5 marks each)**

Q2. Differentiate between continuous and discrete-time signals, as well as continuous and discrete amplitude signals. Moving on to system properties, discuss linearity, additivity, homogeneity.

Q3. Explain the criteria for causality and stability. Also discuss the representation of LTI systems through differential equations and difference equations.

Q4. Discrete Fourier Transform (DFT), and Z-Transform in signal processing and system analysis. Begin by explaining the Fourier series representation of periodic signals and the calculation of Fourier coefficients, emphasizing the significance of waveform symmetries.

Q5. Discuss the Sampling Theorem and its implications in signal processing. Explain the conditions required for successful sampling according to the Sampling Theorem and discuss the consequences of violating these conditions, particularly in terms of aliasing.

Q6. Describe the importance of special signals such as the unit step, unit impulse, sinusoid, complex exponential, and special time-limited signals in signal processing and system analysis.

Section – C **(10 marks each)**

Q7. Explore some special signals importance in electrical engineering. Discuss their characteristics, mathematical representations, and applications in various engineering contexts.

Q8. Explain the concept of convolution and its importance in determining the output of a system for a given input. Discuss the mathematical representation of convolution and its application in signal processing.

Q9. Define Z-Transform and discuss its importance in representing discrete-time signals and systems. Explain the concept of system functions, poles, and zeros in the Z-domain analysis, and their significance in system analysis and design.