Hall Ticket No | | | | | | | | | | |  Question Paper Code: AEEC26

# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal-500043, Hyderabad

**B.Tech VI SEMESTER END EXAMINATIONS (REGULAR) - JULY 2023**
**Regulation: UG-20**
**PRINCIPLES OF SIGNALS AND SYSTEMS**

**Time: 3 Hours** **(ELECTRICAL AND ELECTRONICS ENGINEERING)** **Max Marks: 70**

**Answer ALL questions in Module I and II**
**Answer ONE out of two questions in Modules III, IV and V**
**All Questions Carry Equal Marks**
**All parts of the question must be answered in one place only**

## MODULE – I

1. (a) Draw the signal representation of an exponential and sinusoidal signal with expression. [BL: Understand| CO: 1|Marks: 7]

   (b) Describe in detail about analogy between vectors and signals. Also derive the expression of mean square error. [BL: Understand| CO: 1|Marks: 7]

## MODULE – II

2. (a) Obtain the Fourier transform of the following functions:
   i) Impulse signal
   ii) Rectangular pulse. [BL: Understand| CO: 2|Marks: 7]

   (b) Determine the Fourier transform of x(t)=cos $\omega_0$t u(t). Also plot its frequency response. [BL: Apply| CO: 2|Marks: 7]

## MODULE – III

3. (a) What is an LTI system? Illustrate the characteristics of ideal LPF, HPF and BPF with suitable diagrams. [BL: Understand| CO: 3|Marks: 7]

   (b) List the properties of auto correlation. Determine whether system y(t) = $2t^2$ x(t) is time-invariant or time-variant. [BL: Apply| CO: 3|Marks: 7]

4. (a) Describe distortion less transmission system and plot its magnitude and phase spectrum. [BL: Understand| CO: 4|Marks: 7]

   (b) A system produces an output y(t)=$e^{-t}$u(−t) for an input of x(t)=$2e^{+2t}$u(+t). Determine the impulse response and frequency response of the system [BL: Apply| CO: 4|Marks: 7]

## MODULE – IV

5. (a) Explain the method of obtaining the frequency response of linear shift-invariant systems. [BL: Understand| CO: 5|Marks: 7]

   (b) Find the complete solution of the system represented by 4y[n] – 4y[n-1] + y[n-2] = 2x[n] – x[n-1] for x[n] = u[n] assuming that the system is at initial rest, y[-1] = y[-2] = 0. [BL: Apply| CO: 5|Marks: 7]

6. (a) Determine the relationship between impulse response and frequency response of a discrete time LTI system. [BL: Understand| CO: 5|Marks: 7]

   (b) Check whether the following systems are stable or not,
   i) y(n)=2x(n-1)-3x(n),
   ii) y(n)=x(n)+2x(n-1). [BL: Apply| CO: 4|Marks: 7]

## MODULE – V

7. (a) Draw the butterfly line diagram for 8-point FFT calculation and briefly explain. Use decimation-in-time algorithm. [BL: Understand| CO: 6|Marks: 7]

   (b) Given a sequence x(n) = {0, 1, 2, 3, 4, 5, 6, 7}, determine X(k) using DIT FFT algorithm. [BL: Apply| CO: 6|Marks: 7]

8. (a) Calculate the number of multiplications needed in the calculation of DFT using FFT algorithm with 32-point sequence. [BL: Understand| CO: 6|Marks: 7]

   (b) Find the 8-point DFT of a sequence x(n) = {2, 1, 2, 1, 2, 1, 2, 1} by using DIF FFT algorithm. [BL: Apply| CO: 6|Marks: 7]

– ∘ ∘ ◯ ∘ ∘ –