VIT
Vellore Institute of Technology

REG.NO.:

SCHOOL OF ELECTRONICS ENGINEERING (SENSE)
CONTINUOUS ASSESSMENT TEST - I
GENERAL SEMESTER 2025-2026

SLOT: D2 + TD2

Programme Name & Branch : BTECH - ECE
Course Code and Course Name : BECE301L - Digital Signal Processing - TH
Faculty Name(s) : Dr. Prakasam P, Dr. Sudhakar M S, Dr. Sudhanshu Arya, Dr. Nisha J S, Dr. Saranya K.C., Dr. Jaffino
Class Number(s) : VL2025260500915; VL2025260500913; VL2025260500909; VL2025260506508; VL2025260500907; VL2025260500911
Date of Examination : 30-January-2026 (Friday) – Session 2 (14:00 PM-15:30 PM)
Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- Non-programmable calculator is permitted.
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 - Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes
  CO1: Classify and analyse Signals & Systems along with their time and frequency domain transformations.
  CO2: Simplify Fourier transform computations using swift algorithms.

Q. No	Question	M	CO	BL
1.	a. The discrete-time system is defined as $y(n) = x(n)\cos(\omega_0 n)$. With proper justification, determine whether the system is: i. Static ii. Linear iii. Causal b. Determine the range of values of p and q for the stability of LTI system with impulse response: $$h(n) = \begin{cases} p^n; & n < 0 \\ q^n; & n \geq 0 \end{cases}$$	10	CO1	BL2
2.	For the following causal system, determine: $$y(n) = 0.7y(n-1) - 0.1y(n-2) + 2x(n) - x(n-2)$$ i. Impulse response ii. Step response iii. Also, determine whether the given system is stable or not.	10	CO1	BL3
3.	a. If $X(k)$ is the DFT of the sequence $x(n)$, determine the N –point DFT of the sequence $$y(n) = x(n)\sin\left(\frac{2\pi k_0}{N}n\right), \quad 0 \leq n \leq N-1$$ b. Determine the IDFT of $X(k) = \{3, (2+j), 1, (2-j)\}$	5 5	CO2	BL3

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4.	a. Compute the quantity $\sum_{n=0}^{N-1} x_1(n)x_2(n)$ for the following pair of sequence: $$x_1(n) = x_2(n) = \cos\left(\frac{2\pi}{N}n\right) \text{ for } 0 \le n \le N-1$$ b. Consider the signal: $$x(n) = \begin{cases} 1 + \cos\left(\frac{\pi}{4}n\right) - 0.5\cos\left(\frac{3\pi}{4}n\right), & 0 \le n \le 7 \\ 0, & \text{otherwise} \end{cases}$$ and is represented by the IDFT equation as: $$x(n) = \begin{cases} \frac{1}{8}\sum_{k=0}^{7} X_8(k)e^{\left(\frac{j2\pi k}{8}\right)n}, & 0 \le n \le 7 \\ 0, & \text{otherwise} \end{cases}$$ where $X_8(k)$ is the 8 −point DFT of $x(n)$. Determine $X_8(k)$ for $0 \le k \le 7$.	5 5	CO2	BL3
5.	Given a sequence $x(n) = \{1,2,3,4,4,3,2,1\}$, compute $X(k)$ using Radix−2 DIT FFT algorithm.	10	CO2	BL3

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