Vellore Institute of Technology

SCHOOL OF ELECTRONICS ENGINEERING
CONTINUOUS ASSESSMENT TEST - 2
FALL SEMESTER 2025-2026

SLOT: G1+TG1

Programme Name & Branch	:	B.Tech. Electronics Engineering (VLSI Design and Technology)
Course Code and Course Name	:	BEVD203L SIGNAL PROCESSING
Faculty Name(s)	:	Dr S KALAIVANI and Dr SHWETA THOMAS
Class Number(s)	:	VL2025260102586,84
Date of Examination	:	11th OCTOBER,2025 (AN)
Exam Duration	:	90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes
  CO.3. Apply the Fourier concepts to DT signals and Z transform to analyze the DT systems
  CO.4. Comprehend the various analog filter design techniques and be able to design digital filters.

Q. No	Question	M	CO	BL
1.	(a). Find the 4-point DFT of the following sequence and also plot the magnitude and phase spectrum. $x[n] = \begin{cases} 1, & 0 \le n \le 2 \\ 0, & otherwise \end{cases}$ (b). If x(n)=[1,2,0,3,-2, 4,7,5] evaluate the following, $(i).X(0), (ii).X(4), (iii).\sum_{k=0}^{7} X(k), \quad (iv).\sum_{k=0}^{7} \lvert X(k)\rvert^2$	6+4	3	3
2.	Given a sequence $x(n) = n, for\ 0 \le n \le 7$, determine $X(k)$ using DIT FFT algorithm.	10	3	3
3.	(a). A digital filter with a 3 dB bandwidth of 0.4 is to be designed from the analog filter whose system response is: $H(s) = \frac{\Omega_c}{s + 2\Omega_c}$ Use the bilinear transformation and obtain H(z). (b). The normalized transfer function of an analog filter is given by, $H(s_n) = \frac{1}{s_n^2 + 1.6 s_n + 1}$ Convert the analog filter to a digital low pass filter with a cutoff frequency of 0.6π and sample, using the bilinear transformation	5+5	4	3
4.	Find the order and 3-dB cut off frequency of the digital IIR low-pass Butterworth filter with passband edge at 1000 Hz and stopband edge at 1500 Hz for a sampling frequency of 5000 Hz. The filter is to have a passband ripple of 0.5 dB and a stopband ripple below 30 dB using the bilinear transformation.	10	4	3
5.	Determine the system function $H(z)$ of the lowest order Chebyshev IIR digital filter with the following specifications: 3 dB ripple in passband $0 \le \lvert\omega\rvert \le 0.2\pi$ 25 dB attenuation in stopband $0.45\pi \le \lvert\omega\rvert \le \pi$	10	4	3