Code No. : 16342 N

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.E.E.) VI-Semester Main Examinations, May/June-2023

Digital Signal Processing

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10 × 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO
1.	Sketch the signal 5u[n]+3u[n+3].	2	2	1	1,2,3,12
2.	Determine whether the signal x[n]=sin[n/8]sin[nπ/8] is periodic or aperiodic. If periodic, calculate its time period.	2	2	1	1,2,3,12
3.	Differentiate Discrete Fourier Transform with Fourier Transform.	2	2	2	1,2,3,12
4.	Compute the number of complex multiplications and additions required in performing 32 point FFT.	2	2	2	1,2,3,12
5.	Differentiate Butterworth and Chebyshev filters.	2	2	4	1,2,3,12
6.	Draw a graph between analog and digital angular frequencies in Impulse invariant transformation and Bilinear transformation.	2	2	4	1,2,3,12
7.	Define phase delay and group delay in Finite Impulse Response filters.	2	1	4	1,2,3,12
8.	Write the equation for Hamming window function.	2	1	4	1,2,3,12
9.	In a Buck – Boost converter, draw the graph between duty cycle and voltage gain.	2	2	5	1,2,3,12
10.	List the objectives of controller in Buck – Boost converter and also identify the objective that has higher priority.	2	2	5	1,2,3,12
	Part-B (5×8 = 40 Marks)				
11. a)	Compare digital signal processing and analog signal processing of signals.	4	2	1	1,2,3,12
b)	Check the properties causality, linearity, shift invariance and stability for the system with the equation y[n]=x[n]+nx[n-1].	4	3	1	1,2,3,12
12. a)	Compute convolution of the signals x[n]={1,1,2,2,3,3,4,5} and h[n]={2,-4} using overlap add method.	4	3	3	1,2,3,12
b)	Determine the 8 point Fast Fourier Transform of the signal x[n]={1,-1,2,-2,6,-4,3,-5} using Radix-2 Decimation in Time algorithm.	4	3	2	1,2,3,12

Contd... 2

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13. a)	Design a low pass IIR digital filter using Chebyshev, with the following specifications: Pass band ripple ≤ 0.5dB Stop band ripple ≥ 40dB Pass band frequency: 1.2 kHz Stop band frequency: 2 kHz Sampling frequency: 8 kHz	5	4	4	1,2,3,12
b)	Obtain the direct form – II realization of the filter with difference equation $y[n] = 0.75y[n-1]-0.125y[n-2]+x[n]+0.33x[n-1]$	3	3	4	1,2,3,12
14. a)	Design a linear phase FIR high pass filter using Hamming window with desired frequency response $H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega} \text{ for } -\pi \leq \omega \leq -\omega_c \text{ and } \omega_c \leq \omega \leq \pi \\ 0, \text{otherwise} \end{cases}$. Assume N=7 and $\omega_c = 0.8\pi$	5	4	4	1,2,3,12
b)	Obtain the linear phase realization of the Finite Impulse Response filter with impulse response h[n]={2,1,4,3,4,1,2}.	3	3	4	1,2,3,12
15. a)	Explain the peripherals associated with TMS320LF2407 DSP controller.	4	1	5	1,2,3,12
b)	With a neat block diagram, explain about the control system implemented to control BLDC motor using TMS320LF2407 DSP controller.	4	1	5	1,2,3,12
16. a)	Determine the zero state response for the system described with the difference equation $y[n]-3y[n-1]-4y[n-2]=x[n]+2x[n-1]$ for the input $x[n]=4^n u[n]$	4	3	1	1,2,3,12
b)	Explain how linear convolution of two signals can be obtained using Discrete Fourier Transform.	4	1	2	1,2,3,12
17.	Answer any ***two*** of the following:				
a)	Differentiate IIR filters with FIR filters.	4	2	4	1,2,3,12
b)	Obtain the frequency response of an FIR filter with symmetrical impulse response and odd length.	4	2	4	1,2,3,12
c)	With a neat block diagram, explain about multiplexing in TMS320LF2407 DSP controller.	4	1	5	1,2,3,12

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	25%
ii)	Blooms Taxonomy Level – 2	35%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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