Hall Ticket Number:

1	6	0	2	1	9	7	3	5	0	9	6

Code No. : 16437 AS

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.C.E.) VI-Semester Advanced Supplementary Examinations, August-2022

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.	State the complex conjugate property of DFT?	2	1	1	1
2.	What is an in-place computation in the FFT algorithm?	2	1	1	2
3.	Explain Gibb's phenomenon? How it can be overcome?	2	2	2	2
4.	List the desirable characteristics of the windows used in FIR filter design.	2	1	2	2
5.	Determine the digital filter transfer function from the analog filter impulse response $h_a(t)=e^{-2t}$ using impulse invariant method. Assume the sampling frequency is 1Hz.	2	3	3	2
6.	What are the advantages of the Chebyshev filter over the Butterworth filter?	2	1	3	1
7.	Design a multi-rate system to change the 5 KHz sampling rate into a 2 KHz sampling rate?	2	4	4	3
8.	List the advantages of the multistage approach over single stage approach in sampling rate conversion	2	2	4	2
9.	Write any two instructions that are performed by .M functional unit in the TMS320C67XX processor?	2	4	5	5
10.	What is VLIW architecture? Briefly explain the same.	2	1	5	2
	Part-B (5 × 8 = 40 Marks)				
11. a)	Compute the 4-point DFT of the sequence x(n) ={1, 2, 1, 2} using DITFFT algorithm?	4	3	1	2
b)	Find out the linear convolution of two sequences x(n) ={1,2,3} and h(n) ={1,2,1} using circular convolution.	4	3	1	2
12.	Design an FIR HPF with the frequency response is $H(e^{jw}) = \begin{cases} 1 & \frac{\pi}{3} \le \lvert w \rvert \le \pi \\ 0 & otherwise \end{cases}$ using the hamming window for N=7.	8	4	2	3

Contd... 2

13.	Design a Digital Butterworth LPF to meet the following specifications Pass band frequency: 200 Hz Stop band frequency: 1000 Hz Pass band attenuation $\leq 3dB$ Stop band attenuation $\geq 20dB$ Sampling frequency: 4000 Hz using the bilinear transformation.	8	4	3	3
14. a)	Let x(n)={1,3,2,5,-1,-2,2,3,2,1}, find i) up sample by 2 times and downsample by 4 times ii) downsample by 4 times and upsample by 2 times iii) justify why these outputs are not equal	4	2	4	2
b)	Explain the sub-band coding of a speech signal	4	2	4	2
15. a)	Explain the architectural features of the TMS320C67XX processor?	4	2	5	5
b)	Explain circular addressing in the TMS320C67XX processor with an example?	4	2	5	5
16. a)	Define zero padding? What is the importance of zero padding in DFT with an example?	2	1	1	2
b)	Derive the magnitude response of an FIR filter for impulse response is symmetric and the length of the filter N is odd.	6	4	1	2
17.	Answer any ***two*** of the following:				
a)	Compare FIR and IIR filters	4	2	3	2
b)	State and prove any two identities used in multirate signal processing.	4	3	4	2
c)	Distinguish between DSP processor and General purpose processor	4	1	5	2

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	30%
iii)	Blooms Taxonomy Level – 3 & 4	50%

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