Hall Ticket Number:

Code No. : 16443 AS

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.C.E.) VI-Semester Advanced Supplementary Examinations, July-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	PSO
1.	What is meant by in-place computation in FFT?	2	1	1	1	3
2.	Compute the Circular Convolution of sequences $x_1(n)=\{1,2,3\}$ and $x_2(n)=\{2,1\}$.	2	2	1	2	3
3.	Compare the differences between Hanning and Hamming windows.	2	1	2	1	3
4.	List the desirable characteristics of Windows in FIR filter design.	2	2	2	2	3
5.	What is frequency wrapping effect? How to overcome?	2	1	3	2	3
6.	What is the limitation of impulse invariance transformation method?	2	2	3	2	3
7.	Show that the Up-sampler and Down sampler are time variant Systems.	2	2	4	3	3
8.	What is the importance of filter used in decimation operation?	2	2	4	2	3
9.	What are the advantages of VLIW architecture?	2	2	5	2	3
10.	Write at least four instructions which are supported by. L functional unit.	2	1	5	1	3
	Part-B (5 × 8 = 40 Marks)					
11. a)	State and prove the following properties of DFT. i) Convolution property ii) Linearity property	4	2	1	2	3
b)	Compute 4-point DFT of the sequence $x(n)=\cos\left(\frac{n\pi}{2}\right)$ for $0 \le n \le 4$ using DIT-FFT algorithm.	4	3	1	3	3
12. a)	Draw the cost saving realization structure of an FIR system containing impulse response $h(n)=\{1,\frac{1}{2},\frac{1}{2},1\}$.	3	2	2	2	3
b)	The desired frequency response of filter is given by $H_d(e^{j\omega})=\begin{cases} e^{-j3\omega}; \lvert\omega\rvert \le \frac{3\pi}{4} \\ 0; \frac{3\pi}{4} \le \lvert\omega\rvert \le \pi \end{cases}$ Determine the frequency response of FIR filter, if Hamming window is used with N=7.	5	2	2	2	3

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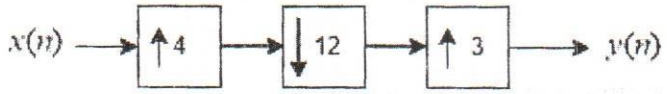
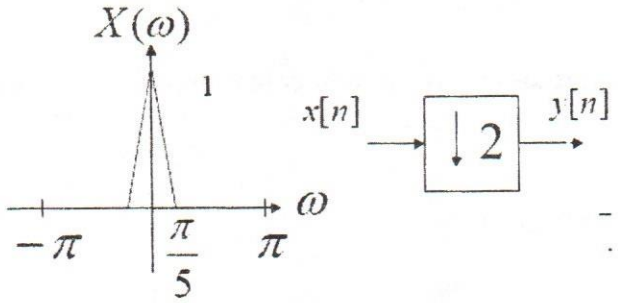
13.	Design a digital IIR butterworth filter using bilinear transformation by considering T=1 second to satisfy the following specifications and draw the Direct form-I realization structure for the same. $0.8 \le \lvert H(e^{j\omega}) \rvert \le 1.0; 0 \le \omega \le 0.4\pi$ $\lvert H(e^{j\omega}) \rvert \le 0.3; 0.7\pi \le \omega \le \pi$	8	3	3	3	3
14. a)	i) Draw the output spectrum of an Interpolator and explain with the mathematical expression. ii) Explain the importance of filter used in interpolation operation.	4	2	4	2	3
b)	Find the output of the following system. X(n)={1,2,3,4,5,6} 	4	3	4	3	3
15. a)	What are the differences between Von Neumann, Harvard and Modified Harvard architecture?	4	2	5	2	3
b)	Draw and explain Pipeline process of DSP processor and explain the operation.	4	3	5	3	3
16. a)	Let h(n)= {1,1} and x(n)= {3,-1,0,1,3,2 } . Find the linear response of the system using Over-lap add method.	4	3	1	2	3
b)	What is the necessary and sufficient condition for achieving linear phase characteristics of an FIR filter? Prove the same.	4	2	2	2	3
17.	Answer any ***two*** of the following:					
a)	For an analog transfer function $H(s) = \frac{2}{(s+1)(s+2)}$ .Determine $H(z)$ using Impulse invariant transformation if T=1 Sec.	4	3	3	3	3
b)	For the given input spectrum, plot the output spectrum Y(ω). 	4	4	4	4	3
c)	Write the differences between general purpose processors and digital signal processors by mentioning at least four points in each.	4	2	5	2	3

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	36.25%
iii)	Blooms Taxonomy Level – 3 & 4	43.75%

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