Hall Ticket Number:

Code No. : 16437

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.C.E.) VI-Semester Main & Backlog Examinations, June-2022

Digital Signal Processing

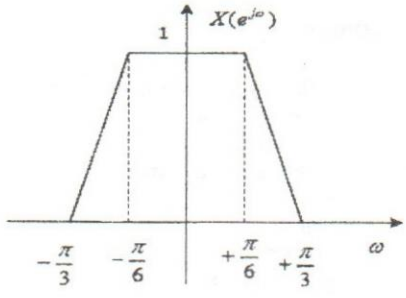
Time: **3 hours** Max. Marks: **60**

*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 and prove time shifting property of DFT.	2	2	1	2
2.	Show that $\sum_{n=0}^{N-1}\|x(n)\|^2 = \frac{1}{N}\sum_{K=0}^{N-1}\|X(K)\|^2$.	2	2	1	2
3.	What is Gibb's phenomenon?	2	1	2	1
4.	Why FIR filters are always stable?	2	1	2	2
5.	Write the properties of Butterworth low pass filter.	2	1	3	1
6.	What is wrapping effect? How to overcome?	2	2	3	1
7.	What is the significance of Multirate Signal processing? What are the applications of Multirate Signal processing?	2	1	4	4
8.	Show that the Up-sampler and Down sampler are time variant Systems.	2	2	4	2
9.	What are the advantages of VLIW architecture?	2	1	5	2
10.	What instructions are used for executing on .L,.S,.M and .D blocks of TMS320c67xx processor.	2	1	5	2
	Part-B (5×8 = 40 Marks)				
11. a)	State and prove the properties of Twiddle factor.	3	2	1	1
b)	Obtain the linear response y(n) of a system If $h(n)=\{2,2,1\}; x(n)=\{1,1\}$ by using Circular Convolution with concentric circles method.	5	3	1	2
12. a)	Draw the direct form structure of $y(n)=\sum_{k=0}^{N-1} h[k].x[n-k]$	2	2	2	2
b)	Design an ideal FIR filter using rectangular window whose desired frequency response is $H_d(e^{j\omega}) = \begin{cases} e^{-j4\omega}; \frac{-\pi}{4} \le \omega \le \frac{\pi}{4} \\ 0; \frac{\pi}{4} \le \lvert\omega\rvert \le \pi \end{cases}$ and draw the realization structure for the same.	6	4	2	3
13. a)	Find the poles of low pass Butterworth filter for N=3.Sketch the location of poles on s-plane and hence determine the normalized transfer function of low pass filter.	3	3	3	2

Contd... 2

b)	Construct a digital Butterworth filter satisfying the constraints. $0.707 \le \lvert H(e^{j\omega})\rvert \le 1; for 0 \le \omega \le \frac{\pi}{2}$ $\lvert H(e^{j\omega})\rvert \le 0.2; for \frac{3\pi}{4} \le \omega \le \pi$ With T=1S using Bilinear transformation.	5	4	3	3
14. a)	Consider the signal $x(n) = a^n u(n), \lvert a\rvert < 1$. a) Determine the spectrum $X(\omega)$. b) The signal x(n) is applied to a decimator that reduces the rate by a factor of 3. determine the output spectrum.	3	2	4	2
b)	The spectrum of a discrete time signal is shown in the figure below. Draw and analyze the spectrum of the decimated signal with neat sketches for D=2.Suggest the mechanism to avoid spectrum overlapping, if needed.  	5	4	4	2
15. a)	What are the different stages in pipelining of C'67xx processor. Explain the functionality of each stage.	4	1	5	1
b)	Explain the functionality of linear addressing mode with relevant example.	4	2	5	1
16. a)	Compute X(K) for the given sequence which containing 4 points by using Radix-2 DIF FFT algorithm. $x(n) = \delta(n) + 2\delta(n-1) + 3\delta(n-3)$	4	3	1	2
b)	What is the necessary and sufficient condition for linear phase Characteristics of an FIR filter? Prove the same.	4	3	2	2
17.	Answer any ***two*** of the following:				
a)	Explain the methodology of Impulse Invariance transformation.	4	2	3	1
b)	State and Prove any four identities required in multirate signal processing.	4	2	4	2
c)	Write the differences between general purpose processors and digital signal processors by mentioning at least eight points in each.	4	2	5	1

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

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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