Reg.No.:												

VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS INSTITUTION AFFILIATED TO ANNA UNIVERSITY, CHENNAI]
Elayampalayam – 637 205, Tiruchengode, Namakkal Dt., Tamil Nadu.

Question Paper Code: 80002

B.E. / B.Tech. DEGREE END-SEMESTER EXAMINATIONS – NOV. / DEC. 2024
Seventh Semester
Electrical and Electronics Engineering
U19EE726 – DIGITAL SIGNAL PROCESSING
(Regulation 2019)

Time: Three Hours Maximum: 100 Marks

Answer ALL the questions

Knowledge Levels (KL)	K1 – Remembering	K3 – Applying	K5 – Evaluating
	K2 – Understanding	K4 – Analyzing	K6 – Creating

PART – A

(10 x 2 = 20 Marks)

Q.No.	Questions	Marks	KL	CO
1.	List few applications of Digital Signal processing.	2	K1	CO1
2.	Define aliasing and anti-aliasing effect.	2	K1	CO1
3.	Relate Fourier transform with Z transform?	2	K1	CO2
4.	Find Z-transform of x(n) = - 0.5 u (-n-1).	2	K1	CO2
5.	Calculate DFT of x(n)={1,1,-2,-2}	2	K3	CO3
6.	Compute the number of multiplications and additions for 32 point DFT and FFT.	2	K3	CO3
7.	Distinguish FIR filter from IIR filter.	2	K4	CO4
8.	Define Gibbs phenomenon.	2	K1	CO4
9.	Infer the special features of DSP processors.	2	K2	CO5
10.	Infer the main components in floating point architecture of TMS320C processor.	2	K2	CO5

PART – B

(5 x 13 = 65 Marks)

Q.No.		Questions	Marks	KL	CO
11.	a)	i. Distinguish the following with examples and formulae (a) Energy Vs power signal (b) Time variant Vs time invariant system.	8	K4	CO1
		ii. Identify whether the following system is linear, time varying $x(n) = nx^2(n)$.	5	K3	
		(OR)			
	b)	i. State Nyquist rate. If the sampling rate is less than the Nyquist rate, What happens? Justify with example.	6	K2	CO1
		ii. Consider the analog signal $x(t)=3cos100\pi t$ a. Determine the minimum sampling rate required to avoid aliasing. b. If the signal is sampled at the rate Fs = 200Hz, what is the discrete time signal obtained after sampling?	7	K3	
12.	a)	Using Z-transform determine the response $y(n)\ for n \geq 0$, $if y(n) = 1/2\ y(n-1) + x(n)$, $x(n) = (1/3)^n u(n)$, and $(-1) = 1$.	13	K3	CO2
		(OR)			
	b)	i. Determine the DTFT of the given sequence $x(n) = a^n((u(n) - u(n-8)), \lvert a\rvert < 1$.	7	K3	CO2
		ii. State and prove the Parseval's theorem.	6	K2	
13.	a)	i. Find the 4-point IDFT of $X(k)=\{10,-2+2j,-2,-2-2j\}$.	7	K3	CO3
		ii. Define and prove convolution property of DFT.	6	K2	
		(OR)			
	b)	Model a signal flow graph from the first principles for computing 8 – point DFT using radix-2 DIT FFT algorithm. Using the above compute the DFT of sequence $x(n)=\{0.5,0.5,0.5,0.5,0,0,0,0\}$.	13	K3	CO3
14.	a)	Develop a length-5 FIR band reject filter with a lower cut off frequency of 2 KHz, an upper cut-off frequency of 2.4 KHz, and a sampling rate of 8000 KHz using Hamming window.	13	K3	CO4
		(OR)			

	b)	Develop an ideal low pass filter with a frequency response $H_d(e^{j\omega}) = \{1 \quad for -\pi/2 \le \omega \le \pi/2,$ $0 \quad for \pi/2 \le \lvert\omega\rvert \le \pi\}$ Find H(z) and the filter coefficients for N=11.	13	K3	CO4
15.	a)	Explain the addressing modes and functional modes of a DSP processor with examples.	13	K2	CO5
		(OR)			
	b)	i. Explain the data path architecture and the bus structure in a DSP processor with suitable diagram.	6	K2	CO5
		ii. Explain how convolution is performed using a single MAC unit.	7	K2	

PART – C

(1 x 15 = 15Marks)

Q.No.		Questions	Marks	KL	CO
16.	a)	Develop a DSP based system for processing the video signals in a video recorder system and explain its operation.	15	K3	CO5
		(OR)			
	b)	Model a Chebychev filter satisfying the constraints using Bilinear transformation. Assume sampling period of T= 1 Sec. Realize the designed filter with cascade structure $0.707 \le \lvert H(e^{j\omega})\rvert \le 1.0; \quad 0 \le \omega \le 0.2\pi$ $0 \le \lvert H(e^{j\omega})\rvert \le 0.1; \quad 0.5\pi \le \omega \le \pi$	15	K3	CO4