DEPARTMENT OF ECE

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu

Academic Year: 2022-2023 (ODD)

Test: CLAT-2   Date: 17/10/22

Course Code & Title: 18ECC204J-Digital Signal Processing   Duration: 1 Hr 45 minutes

Year & Sem: III /V   Max. Marks: 50
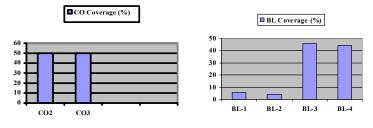
Course Articulation Matrix: *(to be placed)*

	18ECC204J – Digital Signal Processing	Program Outcomes (POs)												PSO		
		Graduate Attributes														
S. No.	Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Summarize the concepts of A//D and D/A converters.	3	-	-	1	-	-	-	-	-	-	-	-	-	-	2
2	Explain the concepts of DFT with its efficient computation by using FFT algorithm.	-	2	-	-	-	-	-	-	-	-	-	-	-	1	
3	Develop FIR filters using several methods	-	2	3	-	-	-	-	-	-	-	-	-	-	-	3
4	Construct IIR filters using several methods	-		3	-	-	-	-	-	-	-	-	-	-	-	3
5	Discuss the basics of multirate DSP and its applications.	-	2	-	-	-	-	-	-	-	-	-	-	-	1	-
6	Design digital filter and multi rate signal processing for real time signals	-	2	-	-	-	-	-	-	-	-	-	-	2	-	-

Part-B   (5 x 10 marks= 50 Marks)
Answer any 5

Q. No	Question	Marks	BL	CO	PO
1	i) Consider two 4-point sequences x(n) = {1, 1, 2, 2} and h(n) ={1, 2, 3, 4}. Let the linear convolution of x[n] and h[n] be denoted by y[n], while z[n] denotes the circular convolution of x[n] and h[n]. Find the value(s) of k for which z[k] = y[k].	5	L4	2	2
	ii) The DFT input sequence is X(k)={0,2,0,2} and the DFT of the impulse response is	4	L4	2	2

	H(k)={15,-3+6j,-5,-3-6j}. Find the output sequence Y(K) and use IDFT to obtain y(n)
	
	 iii) $X(k)$ = { 9, 1+j, 2+j2, 3 , 2-j2, 1-j }is the DFT of a 6-point sequence $x(n)$, then $x(0)$ is
	   a) 1
	   b) 2
	   c) 3
	   d) 4
		1	L2	2	1

2	i) x(n)= 2^n where n=0,1,2,3,4,5,6,7. Compute DFT by DIT-FFT algorithm	9	L4	2	2

	ii) $W_N^{k+\frac{N}{2}} =$
	   a) W_N^k
	   b) $-W_N^{'k}$
	   c) W_N^{-k}
	   d) W_N^{k+N}
		1	L1	2	1

3	i) First five points of the 8 point DFT is given by X(k)=[0,2+j2,-j4,2-j2,0]. Determine the remaining points. Hence find the original sequence x(n) using Decimation in frequency FFT algorithm	9	L4	2	2
	ii) In radix-2 FFT, if the number of points N = 16 then the number of complex additions and number of complex multiplications are a) 8 and 4 b) 24 and 12 c) 64 and 32 d) 160 and 80	1	L2	2	1
4	i) Design FIR filter by truncating the given desired frequency response to 11 samples $H_d(e^{jw}) = \begin{cases} 1 & |\omega| \le \frac{\pi}{3} \ and \ |\omega| \ge \frac{2\pi}{3} \\ 0 & otherwise \end{cases}$ Find the realizable transfer function.	9	L3	3	3
	ii) The anti-symmetric condition with M even is not used in the design of which of the following linear-phase FIR filter? a) Low pass b) High pass c) Band pass d) Band stop	1	L1	3	1

Q	Question	Mark	BL	PO	CO
5	i) Design FIR filter with a frequency response $$H_d(e^{jw}) = \begin{cases} 1 & for\ \dfrac{\pi}{4} \le |\omega| \le \pi \\ 0 & for\ |\omega| \le \dfrac{\pi}{4} \end{cases}$$ using Raised cosine window with $\alpha = 0.54$ and number of samples = 11. Find realizable transfer function.	9	L3	3	3
	ii) In Gibb's phenomenon, the ringing effect is predominantly present near the _____ . a) bandgap b) bandedge c) bandwidth d) bandshell	1	L1	3	1
6	i) Design FIR filter using rectangular window for N=11 having frequency response. $$H_d(e^{jw}) = \begin{cases} j & for -\pi \le |\omega| \le 0 \\ -j & for\ 0 \le |\omega| \le \pi \end{cases}$$ Find realizable transfer function.	9	L3	3	3
	ii) A filter is said to be linear phase filter if the phase delay and group delay are a) High b) Moderate c) Low d) Constant	1	L1	3	1
7	i) Determine the FIR filter coefficients using Fourier series method having N=11 for the given frequency response $$H_d(e^{jw}) = \begin{cases} 1 & for\ \dfrac{\pi}{4} \le |\omega| \le \pi \\ 0 & for\ |\omega| \le \dfrac{\pi}{4} \end{cases}$$	4	L4	3	2
	ii) A system has an impulse response h(n)= $(0.5)^n u(n) + n (0.2)^n u(n)$. Realize the system using parallel form	5	L3	2	3
	iii) Phase of linear phase FIR filter for N=13 is a) 6ω b) 13ω c) -6ω d) -13ω	1	L2	3	1

Course Outcome (CO) and Bloom's level (BL) Coverage in Questions

Evaluation Sheet

Name of the Student:
Register No.:

Part- A (5 x 10 mark = 50 Marks)					
Q. No	CO	PO	Maximum mark	Marks obtained	Total
1 i)	2	2	5		
1 ii)	2	2	4		
1 iii)	2	1	1		
2 i)	2	2	9		
2 ii)	2	1	1		
3 i)	2	2	9		
3 ii)	2	1	1		
4 i)	3	3	9		
4 ii)	3	1	1		
5 i)	3	3	9		
5 ii)	3	1	1		
6 i)	3	3	9		
6 ii)	3	1	1		
7 i)	3	2	4		
7 ii)	2	3	5		
7 iii)	3	1	1		

Consolidated Marks:

CO	Max.Marks	Marks Scored	PO	Max.Marks	Marks Scored
CO2	25		PO1	7	
CO3	25		PO2	31	
Total	50		PO3	32	
			Total	70	

Signature of the Course Teacher