SRM Institute of Science and Technology
College of Engineering and Technology

SET-B

DEPARTMENT OF ECE

SRM Nagar, Kattankulathur – 603203, Chengalpattu District, Tamilnadu.

Academic Year: 2022-2023 (ODD)

Test: CLAT-3 **Date: 19/11/22**
Course Code & Title: 18ECC204J-Digital Signal Processing **Duration: 10:00-11:40 AM**
Year & Sem: III /V **Max. Marks: 50**

Course Articulation Matrix: ***(to be placed)***

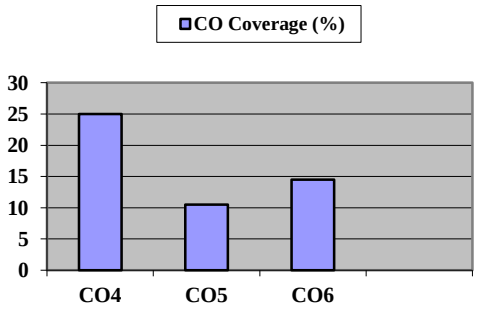
	18ECC204J – Digital Signal Processing	Program Outcomes (POs)														
		Graduate Attributes												PSO		
S. No.	Course Outcomes (COs)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	Summarize the concepts of A//D and D/A converters.	3	-	-	1	-	-	-	-	-	-	-	-	-	-	2
2	Explain the concepts of DFT with its efficient 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	-	-

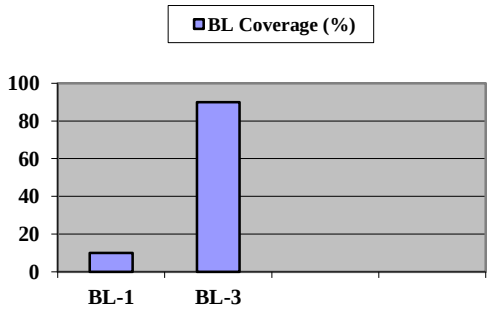
Part-A (5 x 10 marks= 50 Marks)
Answer any 5

Q. No	Question	Marks	BL	CO	PO
1	i) Design an analog Butterworth filter that satisfies the following constraints $0.9 \leq \lvert H(j\Omega)\rvert \leq 1;\ 0 \leq \Omega \leq 0.2\pi$ $\lvert H(j\Omega)\rvert \leq 0.2;\ 0.4\pi \leq \Omega \leq \pi$	9	3	4	3
	ii) The magnitude response of Butterworth filter _____ as the frequency increases. a) Remains constant b) Increases monotonically c) Decreases monotonically d) Increases exponentially	1	1	4	1
2	i) Apply bilinear transformation to $H(s) = \frac{2}{(s+1)(s+2)}$ with T=1 sec and find $H(Z)$. ii) The poles of Chebyshev filter lie on a) Unit circle b) Ellipse c) Parabola d) Hyperbola	9 1	3 1	4 4	3 1
3	i) Determine the order and transfer function of the filter using Chebyshev approximation for the following specifications. $\propto_p = 3bB, \propto_s = 16dB, f_p = 1KHz\ and\ f_s = 2KHz.$ ii) The impulse invariance method is unsuccessful for implementing _____ a) Low pass filter b) High pass filter c) Band stop filter d) Band pass filter	9 1	3 1	4 4	3 1
4	i) Discuss the steps involved in converting sampling rate by a factor of I/D. ii) If x[n] = [1, 2, 3, 4] then y[n]=x[n/2] will be a) [1, 2] b) [1, 0, 2, 0, 3, 0, 4, 0] c) [1, 2, 0, 0] d) [1, 2, 3, 4, 0, 0, 0, 0]	9 1	3 1	5 5	2 1
5	i) Realize M-branch decimator using polyphase structure. ii) A two-channel subband coding filter bank is also called as a) Quadrature-mirror filter bank b) Analysis filter bank c) Synthesis filter bank d) Alias free filter bank	9 1	3 1	6 6	2 1
6	i) Discuss two practical applications of multirate DSP with suitable block diagram. ii) Anti-alias filter is to be kept a) before down sampler	9 1	3 1	6 5	2 1

	b) after down sampler c) after up sampler d) before up sampler				
7	i) Convert the single pole lowpass filter with system function $H(Z) = \frac{0.5(1+Z^{-1})}{1-0.302Z^{-2}}$ into bandpass filter with upper and lower cutoff frequencies ω_u and ω_l respectively. The lowpass filter has 3 dB bandwidth $\omega_p=\frac{\pi}{6}$, $\omega_u=\frac{3\pi}{4}$ and $\omega_l=\frac{\pi}{4}$. ii) Show that the transpose of a factor-of-M decimator is a factor–of-M interpolator if the transpose of a factor-of-M downsampler is a factor-of-M upsampler. iii) _____ filter is used to remove the image spectrum that is introduced due to the addition of zero samples between successive data points. a) Anti-aliasing b) Band pass c) Band stop d) Anti-imaging	**5** **4** **1**	**3** **3** **1**	**4** **5** **6**	**3** **2** **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)	**4**	**3**	**9**		
1 ii)	**4**	**1**	**1**		
2 i)	**4**	**3**	**9**		
2 ii)	**4**	**1**	**1**		
3 i)	**4**	**3**	**9**		
3 ii)	**4**	**1**	**1**		
4 i)	**5**	**2**	**9**		
4 ii)	**5**	**1**	**1**		
5 i)	**6**	**2**	**9**		
5 ii)	**6**	**1**	**1**		
6 i)	**6**	**2**	**9**		
6 ii)	**5**	**1**	**1**		
7 i)	**4**	**3**	**5**		
7 ii)	**5**	**2**	**4**		
7 iii)	**6**	**1**	**1**		

Consolidated Marks:

CO	**Max.Marks**	**Marks Scored**	**PO**	**Max.Marks**	**Marks Scored**
CO4	**25**		**PO1**	**7**	
CO5	**10**		**PO2**	**31**	
CO6	**15**		**PO3**	**32**	
Total	**50**		**Total**	**70**	

Signature of the Course Teacher **Signature of the Course Co-ordinator**

Signature of the Academic Advisor