SRM Institute of Science and Technology
College of Engineering and Technology

SET-A

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: 08:00-09:40 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 = 50 Marks)
Answer any 5

Q. No	Question	Marks	BL	CO	PO
1	i) Design an analog Chebyshev filter that satisfies the following constraints. $1/\sqrt{2} \le \lvert H(j\Omega)\rvert \le 1; \quad 0 \le \Omega \le 2$ $\lvert H(j\Omega)\rvert < 0.1; \quad \Omega \ge 4$	**9**	**3**	**4**	**3**
	ii) A digital signal processing system is described by the expression: y[n] = 2x[n] + x[n – 1] + 2y[n – 1]. The system is: a) Unstable FIR filter b) Unstable IIR filter c) Stable FIR filter d) Stable IIR filter	**1**	**1**	**4**	**1**
2	i) Determine H(Z) using impulse invariant technique for the analog transfer function $H(s) = \frac{1}{(s+1)(s^2+s+1)}$. Assume T=1 sec.	**9**	**3**	**4**	**3**
	ii) In bilinear transformation, the left-half of S-plane is mapped ____in the z-domain a) Entirely outside the unit circle b) Partially outside the unit circle c) Partially inside the unit circle d) Entirely inside the unit circle	**1**	**1**	**4**	**1**
3	i) Determine the normalized transfer function of the 4th order filter whose magnitude response decreases monotonically with increase in frequency.	**9**	**3**	**4**	**3**
	ii) The method that introduces the aliasing effect in filters is a) Approximation of derivatives b) Impulse invariant method c) Bilinear transformation method d) Matched z-transformation technique	**1**	**1**	**4**	**1**
4	i) Derive the spectrum of down sampled signal and also obtain the spectrum after employing suitable filtering operation.	**9**	**3**	**5**	**2**
	ii) If x[n] = [1, 2, 3, 4, 5, 6, 7, 8] then y[n]=x[2n] will be a) [2, 4, 6, 8, 10, 12, 14, 16] b) [1, 0, 3, 0, 5, 0, 7, 0] c) [1, 3, 5, 7] d) [1, 2, 3, 4, 0, 0, 0, 0]	**1**	**1**	**5**	**1**
5	i) Realize M-branch Interpolator using polyphase structure.	**9**	**3**	**6**	**2**
	ii) In sampling rate conversion ,first _____ is to be performed and then _____is to be performed. a) Decimation ,Interpolation b) Interpolation, Decimation c) Up sampling, Down sampling d) Down sampling, Up sampling	**1**	**1**	**6**	**1**

6	i) Design two channel subband coding filter and also derive sufficient condition for alias cancellation ii) Anti-imaging filter is to be kept a) before down sampler b) after down sampler c) after up sampler d) before up sampler	**9** **1**	**3** **1**	**6** **5**	**2** **1**
7	i) Design highpass filter for the given specifications α_p=3 dB, α_s=15 dB, Ω_p=1000 rad/sec and Ω_s=500 rad/sec using frequency transformation. ii) Develop an expression for y(n) as a function of x(n) for the given multirate system x(n) → ↑5 → ↓10 → ↑2 → y(n) iii) Cascading a factor of 2 interpolator and a factor of 3 decimator results in a sampling Rate conversion by a factor of a) 3/2 b) 2/3 c) 6 d) 5	**5** **4** **1**	**3** **3** **1**	**4** **5** **6**	**3** **2** **1**

Evaluation Sheet

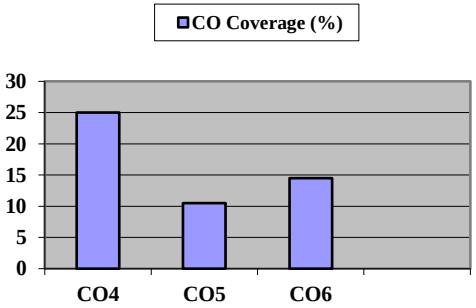
Name of the Student:
Register No.:

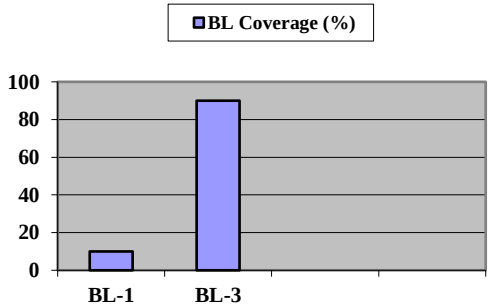
Part- A (5 x 10 = 50 Marks)					
Q. No	**CO**	**PO**	**Maximum mark**	**Marks obtained**	**Total**
1 i)	**4**	**3**	**9**		
1 ii)	**4**	**1**	**1**		
2 i)	**4**	**3**	**9**		
2 ii)	**4**	**1**	**1**		
3 i)	**4**	**3**	**9**		
3 ii)	**4**	**1**	**1**		
4 i)	**5**	**2**	**9**		
4 ii)	**5**	**1**	**1**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

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





Signature of the Course Teacher