Register No : _____

THE KAVERY ENGINEERING COLLEGE

(An Autonomous Institution)

UG/PG DEGREE END SEMESTER THEORY EXAMINATIONS, APRIL-MAY 2026

First Semester

Applied Electronics

PAPT2401 - ADVANCED DIGITAL SIGNAL PROCESSING

Regulations – 2024

Duration : 3 Hrs ***Maximum : 100 Marks***

PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BTL	CO	Marks
1.	Define aliasing. How can it be prevented?	K1	1	2
2.	What is the Discrete Cosine Transform (DCT) and what is its primary application in the context of image processing?	K1	1	2
3.	What is the significance of linear phase in FIR filter design?	K1	2	2
4.	Mention the advantages of using lattice structures in digital filter realization.	K2	2	2
5.	Distinguish between parametric and non-parametric methods for power spectrum estimation.	K2	3	2
6.	Define Autocorrelation. List the properties of Auto Correlation.	K1	3	2
7.	Explain the need of multirate signal processing with suitable example.	K2	4	2
8.	Can fractional sampling have implemented directly? Justify your answer with suitable example	K2	4	2
9.	State the key application of narrow band low pass filter?	K1	5	2
10.	What are the main characteristics of QMF's?	K1	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*16 = 80)

Q.No			Questions	BLT	CO	Marks
11.	a		What is stability triangle. Explain in detail. Test the stability of the system characterized by transfer function. $H(Z) = \frac{1}{1 + Z + 2Z^2 + 3Z^3 + 4Z^4}$	K4	1	16
			Or			
	b		Dissect the expression for energy density spectrum of a Discrete-time sequence.	K4	1	16
12.	a	i	Illustrate the FIR transfer function in cascade Lattice form $H(Z) = 1 + 1.2z^{-1} + 1.12z^{-2} + 0.12z^{-3} - 0.08z^{-4}$	K2	2	10
		ii	Describe the design process for a 2nd order narrow band filter. How are the pole and zero locations on the z-plane manipulated to achieve this specific frequency response?	K2	2	6
			Or			
	b	i	Briefly discuss various designing methods of IIR filter designing.	K2	2	10
		ii	Given a transfer function $H(Z) = \frac{1 + 0.5z^{-1}}{1 - 0.7z^{-1} + 0.4z^{-2}}$ Draw the block diagram for its direct form I and direct form II realizations.	K2	2	6

13.	a	i	Deduce the mean and variance of the power spectral estimate of the Blackman Tukey method.	K5	3	10
		ii	Determine the frequency resolution of Bartlett, Welch and Blackman-Tukey methods of power spectrum estimates for a quality factor Q=10. Assume that overlap in Welch method is 50% and length of sample sequence is 1024.	K5	3	6
			Or			
	b		Interpret Yule walker equation for ARMA, AR and MA models	K5	3	16
14.	a		With the help of block diagram explain the sampling rate conversion by a rational factor `I/D'. Obtain necessary expressions. What are the advantages of using multistage decimation or interpolation?	K2	4	16
			Or			
	b	i	Define down sampling and up sampling with suitable example. Explain how an all-pass filter can be used in up-sampling. What specific property of this filter makes it suitable for this application?	K2	4	10
		ii	What is imaging and aliasing? Show the need for anti- aliasing filter prior to down sampling. How their spectrum differs?	K2	4	6
15.	a	i	Summarize the design consideration for phase shifters in integrated circuits.	K2	5	10
		ii	Demonstrate how a digital system with different sampling rates is interfaced and what are the challenges arises during this process?	K2	5	6
			Or			
	b		Explain in detail about oversampling A/D and D/A converter	K2	5	16

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