QP Code: RM23MTECH109 | Reg. No | | | | | | | | | | | AY 23

GIET UNIVERSITY, GUNUPUR – 765022

M. Tech (Second Semester) Examinations, May – 2024

MPCEC2020 - Advanced Digital Signal Processing

(ECE)

Time: 3 Hrs | Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

PART – A **(2 x 10 = 20 Marks)**

Q.1. Answer all questions	CO#	Blooms Level
a. What are FIR/IIR cascaded lattice structures, and how are they advantageous in filter design?	CO1	K2
b. Briefly describe FFT algorithms and their significance in signal processing applications.	CO1	K1
c. What are decimators and interpolators, and how are they used in multi-rate signal processing?	CO1	K2
d. Describe the process of sampling rate conversion and its importance in digital signal processing.	CO2	K3
e. What is the primary purpose of Wiener filters in signal processing?	CO3	K2
f. Explain the concept of a stationary random process briefly.	CO3	K2
g. What are adaptive filters, and how do they differ from traditional fixed filters?	CO4	K3
h. Explain the concept of the Minimum Mean Square Criterion in adaptive filtering.	CO4	K1
i. Briefly describe the concept of eigenanalysis in the context of spectrum estimation.	CO2	K2
j. What is minimum-variance spectral estimation, and how does it contribute to spectrum estimation?	CO2	K1

PART – B **(10 x 5=50 Marks)**

Answer ***ANY FIVE*** questions	Marks	CO#	Blooms Level
2. a. Provide an overview of digital signal processing (DSP), covering its history, applications, and key advantages over analog signal processing methods.	5	CO1	K3
b. Describe the impulse invariance method and the bilinear transformation method for designing IIR filters.	5	CO1	K2
3.a. Discuss the concept of sub band coding in digital signal processing, including its principles, advantages, and applications in audio and image compression.	5	CO2	K3
b. Provide an overview of Quadrature Mirror Filters (QMF) and their role in multi-rate signal processing.	5	CO2	K4
4. a. Explore the advantages and practical applications of forward-backward linear prediction filters over traditional linear prediction techniques	5	CO3	K5
b. Discuss the significance of Average Run Length (ARL) in signal detection and estimation. How is ARL calculated, and what insights does it offer into the	5	CO3	K3

	performance of detection algorithms?			
5.a.	Discuss the principles and operation of the Gradient Adaptive Lattice algorithm in adaptive filtering.	5	CO4	K3
b.	Discuss the Recursive Least Squares (RLS) algorithm in adaptive filtering, including its principles, mathematical formulation, and applications.	5	CO4	K4
6. a.	Discuss the challenges and techniques involved in estimating spectra from finite-duration observations of signals.	5	CO2	K5
b.	Compare and contrast nonparametric and parametric methods for power spectrum estimation.	5	CO2	K3
7.a.	Discuss the applications of FFT in various signal processing tasks, such as spectrum analysis, convolution, filtering, and modulation.	5	CO1	K5
b.	Describe the process of characterizing signals in both time and frequency domains.	5	CO1	K4
8. a.	Explain the operation of popular adaptive filter algorithms such as the Least Mean Squares (LMS) algorithm and the Recursive Least Squares (RLS) algorithm.	5	CO3	K3
b.	Explore the concept of eigenanalysis and its role in spectrum estimation	5	CO4	K4

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