

Roll No: _____

Department of Computer Science & Engineering
School of Engineering Sciences & technology
Jamia Hamdard
Even Semester Examination 2023

Marks: 75

Subject Code: BTECE DEI23

Time: 3 Hrs

Subject Name: Adaptive signal Processing

Note: Please do proper numbering of Attempted Questions.

Section A

[7 x 5 marks = 35 marks]

Note: All the Questions are Compulsory. Each question carry equal marks

Q.No	Question	CO	BL
Q1.	With the help of a suitable example, discuss the applications where adaptive signaling can be used?	CO1	L2
Q2.	With the help of a suitable mathematical expressions, explain the significance of excess mean square error and mis-adjustment in context of Filter optimization?	CO2	L3
Q3.	What is the significance of development of different types of LMS algorithm for filter optimization?	CO3	L3
Q4.	With the help of a suitable figure, explain the significance of the given equation: $y_k = \sum_{l=0}^L w_{lk} x_{k-l}$ What are the meaning of different terms used in the above equation?	CO2	L5
Q5.	What is the importance of vector space? With the help of a suitable example, explain the significance of inner product?	CO4	L2
Q6.	Draw the block diagram of a conventional filter. Explain how does the adaptive filter varies from it. Discuss in detail.	CO3	L1
Q7.	Draw the structure for the correlation structure and explain its significance?	CO1	L2

Section B

[4 x 10 marks = 40 marks]

Note: Attempt any Four (4) Questions only. Each question carry equal marks

Q. No	Question	CO	BL
Q1.	What are the different axioms of probability? Explain each with the help of a suitable example? When a process is called a stationary process?? Ten numbered cards are there from 1 to 15, and two cards are chosen at random such that the sum of the numbers on both the cards is even. Find the probability that the chosen cards are odd-numbered.?	CO1	L4

Q2.	Explain the concept of basis in a vector space. let π be the plane in $\mathbb{R}^3$ spanned by following vector $X1 = (1, 2, 2)$ $X2 = (-1, 0, 2)$ a) What is the meaning of orthonormal basis? Find the orthonormal basis for π b) extend the orthonormal basis for $\mathbb{R}^3$	CO2	L6
Q3.	Write a short note on any Two (2) of the following: a) Orthogonality b) Rank and Nullity theorem c) Orthogonal Projection with the help of example	CO4	L2
Q4.	In context of Adaptive Signal Processing, derive the following equation $2(RW - P)\nabla = E[\hat{V}_k]$ Explain the importance of the above equation.	CO3	L4
Q5.	With the help of a 3-D model, explain the concept of determining the performance function. Explain the mathematical concept in determining the concept behind steepest descent method?	CO3	L3
Q6.	With the help of a suitable block diagram, discuss the advantage of Block Adaptive Filter. Discuss the development of sub-band adaptive filtering.	CO2	L3

BL – Bloom's Taxonomy Levels

(1- Remembering, 2- Understanding, 3- Applying, 4- Analyzing, 5- Evaluating, 6- Creating)

CO – Course Outcomes

***** End of Paper *****