Hall Ticket Number:

Code No. : 18432 (B) N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (E.C.E.) VIII-Semester Main & Backlog Examinations, May-2023

Adaptive Signal Processing (PE-VI)

Time: **3 hours** Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

Part-A (10× 2 = 20 Marks)

Q. No.	Stem of the question	M	L	CO	PO	PSO
1.	Specify the limitations of Wiener filter.	2	2	2	1	3
2.	Determine whether the following matrix is a valid correlation matrix $R = \begin{bmatrix} 1 & 1/2 & 1 \\ 1/2 & 2 & 1/2 \\ 1 & 1 & 1 \end{bmatrix}$	2	3	1	2	3
3.	List the necessary conditions for the convergence of LMS algorithm?	2	1	2	1	3
4.	Compare the advantages of RLS algorithm over LMS algorithm.	2	2	3	1	3
5.	Summarize any two applications of adaptive filters.	2	2	1	1	3
6.	Explain the role of cost function in adaptive filter design.	2	2	3	1	3
7.	Describe the advantages of Kalman filter over Wiener filter.	2	1	5	1	3
8.	Construct a signal flow graph for the Kalman filter.	2	3	5	2	3
9.	Compare the performance of vector Kalman filter with Kalman filter.	2	2	4	1	3
10.	Discuss the applications of vector Kalman filter.	2	2	4	1	3
	Part-B (5×8 = 40 Marks)					
11. a)	How the Gradient operator helps to minimize the mean square error, explain with an example?	4	2	1	2	3
b)	Consider a two-tap Wiener filter with the following statistics $E[d^2(n)] = 2$, $R = \begin{bmatrix} 1 & 0.7 \\ 0.7 & 1 \end{bmatrix}$ and $P = \begin{bmatrix} 1 \\ 0.5 \end{bmatrix}$ Where d(n) is the desired output, R is the correlation matrix and P is the cross-correlation matrix of input and desired output. Find the optimum values of the filter.	4	3	1	2	3

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12. a)	Discuss the condition for convergence of weight vector in LMS algorithm.	4	2	3	1	3
b)	Derive the equation of MSE for steepest descent algorithm.	4	3	3	2	3
13. a)	Discuss about Cancellation of Echoes in long distance telephone circuits.	4	3	4	1	3
b)	Illustrate Adaptive Beam forming with examples.	4	1	4	1	3
14. a)	Discuss the steps involved in Recursive Minimum Mean Square estimator for scalar random variables.	4	3	3	2	3
b)	Discuss how Kalman gain vector is computed in LMS algorithm.	4	2	3	1	3
15. a)	Design the vector Kalman filter with an example.	4	3	5	2	3
b)	Discuss the applications of tracking using vector Kalman filter.	4	2	5	1	3
16. a)	State and derive the expression for principle of orthogonally.	4	3	1	2	3
b)	Describe about learning curves and bring out its importance with respect to gradient search algorithms.	4	2	1	1	3
17.	Answer any ***two*** of the following:					
a)	Discuss the significance of Wiener solution for any adaptive algorithm?	4	1	2	1	3
b)	Discuss the limitations of Wiener filter and explain how these limitations are rectified in Kalman filter.	4	1	2	1	3
c)	Describe about the target tracking of aircraft using Vector Kalman filtering.	4	3	5	1	3

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	40%

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