## GUJARAT TECHNOLOGICAL UNIVERSITY ME Semester –III Examination Dec. - 2011

Subject code: 730405 Date: 08/1 Subject Name: Adaptive Signal Processing				
Time: 10.30 am – 01.00 pm Total Ma			<sup>.</sup> ks: 70	
<ul> <li>Instructions:</li> <li>1. Attempt all questions.</li> <li>2. Make suitable assumptions wherever necessary.</li> <li>3. Figures to the right indicate full marks.</li> </ul>				
Q.1	(a) (b)	Explain four basic classes of adaptive filtering applications. Define correlation matrix and prove any two properties of correlation matrix	07 07	
Q.2	(a) (b)	State and derive the principal of orthogonality. Explain the Yule-Walker equation for a WSS process <b>OR</b>	07 07	
	<b>(b)</b>	Define power spectral density and derive any two properties	07	
Q.3	(a) (b)	Derive Winner-hopf equation for a filtering problem Derive mean square error in canonical form for Winner filter	07 07	
Q.3	<b>(a)</b>	Consider a Wiener filtering problem characterized by the following values for the correlation matrix R of the tap-input vector $u(n)$ & the cross correlation vector P between $u(n)$ and the desired response $d(n)$	07	
		$\mathbf{R} = \begin{pmatrix} 1 & 0.5 \\ 0.5 & 1 \end{pmatrix}$		
		$P = \begin{pmatrix} 0.5\\ 0.25 \end{pmatrix}$		
		(a) Suggest a suitable value for the step size parameter $\mu$ that would ensure convergence of the method of Steepest descent, based on the given value for matrix R.		
	(b)	<ul> <li>If mean square error is given by, J = 15 + 20W + 10W<sup>2</sup> then find out,</li> <li>a) W<sub>opt</sub> and J<sub>min</sub></li> <li>b) Given Steepest descent algorithm for conversion factor μ = 0.04, determine J<sub>min</sub> after 3 iteration.</li> </ul>	07	
Q.4	(a)	Show the Misadjustment parameter for LMS filter is $M = (\mu$	07	

/ 2) \* tr[R](b) Explain the all-pole, all-pass lattice structure for linear predictors. 07

OR

Q.4 (a) Explain forward liner prediction

07

Q.4	(b)	Apply steepest –descent algorithm to winner filter and derive weight update equation.	07
Q.5	(a) (b)	Compare the LMS algorithm with the Steepest descent algorithm Derive mean square error in canonical form for LMS algorithm	07 07
		OR	
Q.5	(a)	Explain and Derive LMS algorithm	07
	<b>(b)</b>	Explain RLS algorithm	07

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