Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME- SEMESTER II • EXAMINATION – SUMMER – 2017

Subject Code:2722601 **Date:26/05/2017**

Subject Name:Advanced Digital Signal Processing and Applications

Time: 02:30 PM to 05:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Explain the difference between correlation and autocorrelation in case of Random variables. Give suitable statistical example with assumed data set.	**07**
	(b)	Define random variable and properties of its distribution function with suitable statistical example.	**07**
Q.2	**(a)**	What is Adaptive Linear Combiner ? Discuss System Modeling using Adaptive Linear Combiner.	**07**
	(b)	Explain linear mean square estimation in detail with suitable statistical example.	**07**
		OR	
	(b)	Explain ensemble averages of random process.	**07**
Q.3	**(a)**	Discuss the ARMA model for Power Spectrum estimation.	**07**
	(b)	Obtain Yule-Walker equation for AR process from the generalized relations for ARMA process .	**07**
		OR	
Q.3	**(a)**	Define the followings. (i) Backward Prediction Error (ii) Correlated random variable (iii) Orthogonal random variable (iv) Power density spectrum (v) Ensemble Averages (vi) Adaptive filter (vii) Independent Random Variable	**07**
	(b)	Suppose that $\xi = 2x_0^2 + 2x_1^2 + 2x_0x_1 - 14x_0 - 16x_1 + 42$ is the Performance Surface of a Transversal Filter. A stationary random signal, b, having samples correlated such that E[b_k b_k] = 2 and E[b_k b_{k-1}]= 1. What is the perturbation, P, in the mean square error on the perturbation equal to δ?	**07**
Q.4	**(a)**	Find out the fourth moment if the Error, e_k, is distributed randomly such that all values from 0 to 2 are equally likely.	**07**
	(b)	If the distribution of a random variable is Gaussian with zero mean and σ standard deviation, find the true fourth moment.	**07**
		OR	
Q.4	**(a)**	Compare LMS and RLS algorithms.	**07**
	(b)	What range of values of the convergence parameter will provide an over damped weight adjustment curve for the Univariable Performance Surface given by $2\xi = (4/5)\,\alpha^2 + 8\alpha + 22$?	**07**
Q.5	**(a)**	Explain in detail 'the Stochastic-gradient-descent algorithm' for FIR adaptive filter.	**07**
	(b)	What is Least mean-squared error criterion? Explain the steepest descent method.	**07**

OR

Q.5	**(a)**	Prepare an Algorithm for implementing LMS algorithm in Matlab.	**07**
	(b)	Compare various FIR filter structures.	**07**

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