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B.E. / B. Tech. (Full Time)DEGREE EXAMINATION, APRIL / MAY 2013
Electronics and Communication Engineering
EC 9037 ADVANCED DIGITAL SIGNAL PROCESSING

Time: 3 Hrs. Max.Marks: 100

Answer All Questions

Part-A (10 x 2 = 20 Marks)

1. What are the three conditions for a random process to be wide-sense stationary?
2. Show that power spectrum of a random process x(n) is real.
3. Define Bias and consistency.
4. Write the expressions for power spectrum estimation in AR and MA processes.
5. Design a 2-tap FIR Weiner filter W(z) to estimate d(n) from x(n)=d(n)+v(n), given that $r_d(k)=0.8^{|k|}$ and v(n) is unit variance zero mean white noise uncorrelated with d(n).
6. Write weiner-hopf equations for non-causal and causal IIR filters.
7. What is the advantage of adaptive filters over weiner filters?
8.. Draw the set up for system identification using adaptive filter.
9. What is MRA dilation equation?
10. Briefly explain homomorphic filtering..

Part-B (16 x 5 = 80 Marks)

11. Derive the necessary expressions for Fast Wavelet transform and draw the scheme for obtaining approximation and detail coefficients from j+1 resolution to resolution j.

12(a). Determine the autocorrelation of the random process x(n) generated by filtering unit variance white noise w(n) with a LSI filter $H(z) = 1 / (1 - 0.25 z^{-1})$.

OR

12(b). Derive Yule-Walker equations for ARMA process.

13(a). Explain Blackman-Tukey power spectrum estimation.

OR

13(b). Obtain a third-order all-pole model using Levinson-Durbin recursion given that $r_x(0) = 1$, $r_x(1) = 0.5$, $r_x(2) = 0.5$, $r_x(3) = 0.25$

14(a). Determine the causal IIR Weiner filter to estimate d(n) from x(n)=d(n)+v(n) where v(n) is unit variance white noise that is uncorrelated with d(n) given that d(n) is generated by d(n)=0.8d(n-1) + w(n) where w(n) is white noise with variance = 0.36.

OR

14(b). Explain noncausal IIR Wiener filter for estimating the desired component from the white noise corrupted signal.

(PTO)

15(a). Derive the weight update equations in LMS algorithm.

OR

15(b). Derive the weight update equations in Normalized LMS algorithm and explain how gradient noise amplification is avoided.

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