Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 71023

M.E./M.Tech. DEGREE EXAMINATION, JUNE/JULY 2013.

First Semester

Applied Electronics

AP 9211/DS 9311/AP 911/UAP 9114/10244 CM 104 — ADVANCED DIGITAL SIGNAL PROCESSING/STATISTICAL SIGNAL PROCESSING

(Common to M.E. Communication Systems, M.E. Computer and Communication, M.E. Digital Electronics and Communication Engineering and M.Tech. Information and Communication Technology and M.E. Digital Signal Processing)

(Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define statistical variance and covariance.

2. How do you compute the energy of a discrete signal in time and frequency domains?

3. Define sample autocorrelation function. Give the mean value of this estimate.

4. What is the basic principle of Welch method to estimate power spectrum?

5. How will you find the ML estimate?

6. Give the basic principle of Levinson recursion.

7. Why are FIR filters widely used for adaptive filters?

8. State the properties of Widrow-Hopf LMS adaptive algorithm.

9. What is meant by image smoothing and image sharpening?

10. Give the two channel wavelet filter banks to decompose the input signal into frequency bands.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Write short notes on the following :

(1) Uniform noise. (3)

(2) Wiener Khintchine theorem. (3)

(3) Power spectrum. (3)

(ii) Enumerate on the physical significance of spectral factorization. (7)

Or

(b) (i) Define Hilbert space and orthogonal projection. How does it help in estimation? (8)

(ii) Explain the steps in the determination of the autocorrelation and power spectrum of a random process. (8)

12. (a) (i) Define cross correlation and cross spectrum. Relate the output cross spectrum in terms of input cross spectrum while filtering a random process. (10)

(ii) Explain in detail about smoothed spectral estimation. (6)

Or

(b) Describe the model based approach to power spectral estimation. Define AR, MA, and ARMA models. Illustrate the ARMA model for spectrum estimation. (16)

13. (a) (i) Give the properties of linear estimators and the Cramer-Rao bound. (8)

(ii) Briefly explain the estimation of a non stationary process by a Kalman filter. (8)

Or

(b) (i) Describe the basics of forward linear prediction. Give the schematic of FIR filter and Lattice filter for the first order predictor. (8)

(ii) Derive the recursive predictor coefficients for optimum lattice predictor by Levinson-Durbin algorithm. (8)

14. (a) (i) What do you understand by an adaptive filter? Discuss the minimum MSE criterion to develop an adaptive FIR filter. (8)

(ii) Explain the adaptive channel equalization in detail. (8)

Or

(b) (i) Write short note on the Newton's steepest descent algorithm. (10)

(ii) Derive the first order adaptive filter equation and explain about the LMS adaptation algorithm. (6)

15. (a) (i) Define 2D DFT and state its separability and peridiocity properties. (10)

(ii) Explain the application of wavelets in signal compression. (6)

Or

(b) (i) Enumerate in detail about the continuous and discrete wavelet transforms. (10)

(ii) Write a short note on the multiresolution analysis. (6)
