ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES
(AUTONOMOUS)

M.Tech II-Semester Regular Examinations, May 2016

Statistical signal processing

(Communication Systems)

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

Answer ONE Question from each unit
All questions carry equal marks
All parts of the question must be answered at one place only

UNIT-I

1) Explain in detail about the role of estimation in signal processing? Write about the Cramer-Rao Lower bound. **[12M]**

(OR)

2) Write about unbiased estimators.Write about finding MVU estimators. **[12M]**

UNIT-II

3) Write about recursive least squares estimation. **[12M]**

(OR)

4) Explain the best linear unbiased estimation. **[12M]**

UNIT-III

5) Explain the Bayesian Linear model. **[12M]**

(OR)

6) Explain about maximum aposteriori estimators. **[12M]**

UNIT-IV

7) a) What is a dynamical system ? **[2M]**

b) Define the state of a dynamical system? **[2M]**

c) Distinguish between Weiner and Kalman filters? **[4M]**

d) What is meant by ‘innovation” w.r.t. the Kalman filter ? **[2M]**

e) What is the Extended Kalman Filter (EKF) ? **[2M]**

(OR)

8) Assume we observe the data $x[k] = Ar^k + w[k]$ for $k = 0,1,\ldots N.$;where A is the realization of a random variable with p.d.f. $N(\mu_A,\sigma^2_A)$, $0 < r < 1$, and the w[k]'s are samples of WGN, with variance σ^2 .Also assume that A is independent of the w[k]'s. Find the sequential MMSE estimator of A based on {x[0], x[1],…….x[N]. **[12M]**

UNIT-V

9) a) Derive the likelihood ratio test (LRT), under the Neyman Pearson (NP) criterion for a binary hypothesis problem. **[8M]**

b) When does the LRT test under minimum probability of error criterion become identical to that under NP criterion? **[4M]**

(OR)

10) a) Consider the following detection problem: Under hypothesis H0, the measured data is x[0]= w[0]; where w[0] is zero mean Gaussian noise with variance 1. Under hypothesis H1, x[0]= 2 + w[0] . A detector decides H1 if x[0] > 1 and H0 otherwise. What is the probability of false alarm in this case. **[6M]**

b) Under what criteria is the detector optimal? Explain? **[6M]**

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