Printed Pages: 1 Sub Code:MTEC 202

Paper Id: 2 3 1 2 1 0 Roll No. [redacted]

**M.TECH.**
**(SEM-II ) THEORY EXAMINATION 2017-18**
**DETECTION AND ESTIMATION THEORY**

***Time: 3 Hours*** ***Total Marks: 70***

**Note:** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt *all* questions in brief. 2 x 7 = 14**

a. Discuss nonlinear minimum mean squared error estimators.
b. What is an estimator? List important properties of estimators.
c. Explain the power special density functions.
d. Draw & explain hypothesis testing in brief.
e. Distinguish between Point Processes and Gaussian processes.
f. What do you understand by "linear model " in estimation.
g. Write the application of orthogonality principles in communication engineering.

**SECTION B**

**2. Attempt any *three* of the following: 7 x 3 = 21**

a. List important properties of estimators. What do you understand by "Discrete linear model" in estimation?
b. What is the significance of nonparametric estimators of probability distribution? Explain.
c. What are the applications of Kalman Filters?
d. List the properties of Probability Distribution Functions
e. Explain the Neymen-Pearson criterion for radar detection of constant amplitude signal

**SECTION C**

**3. Attempt any *one* part of the following: 7 x 1 = 7**

(a) Discuss briefly what you understand by composite Hypothesis testing.
(b) Derive the likelihood ratio test (LRT), under the Neyman Pearson (NP) criterion for a binary hypothesis problem.

**4. Attempt any *one* part of the following: 7 x 1 = 7**

(a) Explain model-based estimation of autocorrelation functions.
(b) Write the procedures for the detection of signals with random parameters.

**5. Attempt any *one* part of the following: 7 x 1 = 7**

(a) Discuss the performance evaluation of signal detection procedures.
(b) With neat sketch explain kalman filters and its mathematical analysis.

**6. Attempt any *one* part of the following: 7 x 1 = 7**

(a) Prove that for simple binary hypothesis tests the slope of a curve in a ROC at a particular point is equal to the value of threshold n required to achieve the PD and PF of the point.
(b) What are the applications of Digital Wiener Filters?

**7. Attempt any *one* part of the following: 7 x 1 = 7**

(a) Define the likelihood function and explain the method of Maximum Likelihood(ML) estimation.
(b) Explain joint MAP estimates in additive white Gaussian noise channel.