Model Question Paper

Second Semester M. Tech Degree Examination in
Electronics and Communication Engineering
Stream: Telecommunication Engineering (2013 Scheme)

TSC.2001: ESTIMATION AND DETECTION THEORY

Time : 3 hours Max. Marks : 60

Instructions: *Answer any 2 questions from each module (Each Carries 10 Marks)*

MODULE 1

1. Explain Bay's criterion. Derive the expression for likelihood ratio test. (10)
2. a) Sketch the risk curves for different values of a priory probability and discuss about minimax test. (5)
   b) Explain Neyman Pearson criterion (5)
3. Design a minimum probability of error detector to decide between hypotheses whose probability distribution functions are (10)

   $P[x[0]/H0] = \frac{1}{2} \exp(-|x[0]+1|)$
   $P[x[0]/H1] = \frac{1}{2} \exp(-|x[0]|)$
   $P[x[0]/H2] = \frac{1}{2} \exp(-|x[0]-1|)$

MODULE 2

4. Consider the binary hypothesis testing problem in which the received signals under hypotheses H1 and H0 is

   H1: $Yk = m+Nk$, $k=1,2\ldots\ldots\ldots K$
   H0: $Yk = Nk$, $k=1,2\ldots\ldots\ldots K$

   a) Assuming the constant 'm' is not known, obtain the maximum likelihood estimate $\hat{m}$ ml of the mean. (5)
   b) Suppose that the mean 'm' is known, but the variance σ^2 is unknown. Obtain MLE of $\theta=\sigma^2$. (5)
5. a) Explain in detail about Bay's Estimation.How unknown parameter is estimated using MMSE and MAP estimators? (5)
   b) Explain criteria for good estimators. (5)
6. Consider the problem where the observed samples are

   $Yk = M+Nk$, $k=1,2\ldots\ldots K$

   M and Nk are statistically independent Guassian random variables with zero mean and variance σ^2 . Find $\hat{m}$ ms and $\hat{m}$ map. (10)

MODULE 3

7. a) Explain in detail about Wiener and Kalman filtering. (5)
   b)Explain Lattice filter structure. (5)
8. Explain the application of Estimation and detection in the fields of system identification and adaptive filtering. (10)
9. Explain how speech processing and image processing find application in estimation and detection. (10)