Total No. of Questions : 10]

SEAT No. :

P3130

[Total No. of Pages : 3

[5354]-620
B.E. (E & TC)
DETECTION AND ESTIMATION THEORY
(2012 Pattern) (Elective - IV)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Attempt Q.No. 1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q7 or Q.8, Q.9 or Q.10.***
2) ***Figures to the right indicate full marks.***

Q1) a) Write characteristics of Maximum Likelihood Estimator. **[5]**

b) What is Bayes criteria. Derive the expression for Bayes Dession rule. Under what condition Bayes criteria reduces to LRT and MAP. **[5]**

OR

Q2) a) Explain Recursive Least Square Estimation. **[5]**

b) Explain how decision rule is framed in case of multiple hypothesis tests. **[5]**

Q3) a) Write a short note on Minimum Variance Unbiased Estimator. **[5]**

b) State and explain Cramer-Rao inequality for a Random Parameter. **[5]**

OR

Q4) a) A ternary communication system transmits one of the three amplitude signal {1, 2, 3} with equal probabilities. The independent received signal samples under each hypothesis are **[5]**

$$H1 : Yk = 1 + N \quad K = 1, 2..K$$

$$H2 : Yk = 2 + N \quad K = 1, 2...K$$

$$H3 : Yk = 3 + N \quad K = I,2,...K$$

The additive noise N is Gaussian with mean zero and variance $\sigma 2$. The costs are Cii = 0 and Cij = 1 for $i \neq j$. Ij, j = 1, 2, 3 determine the decision regions

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b) Discuss the Bays estimation method briefly for Least Square Estimation and Kalman filter. **[5]**

Q5) a) Write a note on Discrete Wiener Filter. **[8]**

b) Explain Kalmans filter in context of estimation theory. **[8]**

OR

Q6) a) What is Cramer Rao Bound inequality and what are its limitations discuss in detail. **[8]**

b) Write a note on Recursive Least-Square Estimator. **[8]**

Q7) a) In the received signal under hypothesis H_1 and H_0 was **[8]**

$H_1 : Yk = m + N_k,$ $\quad k = 1, 2,...K$

$H_0 : Y_k = N_k,$ $\quad k = 1, 2,....K$

i) Assuming the constant m is unknown. Obtain the Maximum Likelihood estimation of the mean

ii) Suppose now mean 'm' is known but the variance is unknown. Obtain the MLE.

b) In on-off keying system, the source transmits signal of amplitude I volt or 0 volt. Noise n(t) is added which has zero mean and variance = 1 and it is Gaussian. Set up the LRT (Likelihood Ratio Test) for this problem.**[8]**

OR

Q8) a) A rectangular pulse of known amplitude A is transmitted starting at time instant t_0 with probability 1/2. The duration T of the pulse is a random variable uniformly distributed over the interval [T1, T2]. The additive noise to the pulse is white Gaussian with mean zero and variance N0/2. Determine the likelihood ratio. **[8]**

b) Explain best linear unbiased Estimator (BLUE)? **[8]**

Q9) a) Explain the Radar Elementary concepts- Range, Range Resolution, and Doppler Shift. **[9]**

b) Give a Review of Some CFAR Detectors. **[9]**

OR

Q10)a) What is CFAR Detection and state the Principles of Adaptive CFAR Detection. **[9]**

b) Write short note on Neyman-Pearson detector. **[9]**

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