APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER

Q. P. Code: CESP0822222-I **(Pages: 2)**

Name: .....

Reg. No:.....

SECOND SEMESTER M.TECH. DEGREE EXAMINATION JULY 2022

Branch: Electronics and Communication Engineering **Specialization: Communication Engineering & Signal Processing**

08EC6222 ESTIMATION AND DETECTION

Time:3 Hours **Max.Marks: 60**

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q. No.	Module 1	Marks
1. a	Explain the concept of binary decision.	3
	Answer b or c	
b	Obtain the decision region for the given conditional pdf using Neyman-Pearson criterion $P(z/m_1) = \frac{1}{\sqrt{2\pi}} e^{\frac{-z^2}{2}}$ $P(z/m_2) = \frac{1}{\sqrt{2\pi}} e^{\frac{-(z-1)^2}{2}}$ Let P(d2/m1) = 0.25, Q(0.674) = 0.25	6
c	Derive the expression for decision rule using Probability of Error criterion	6

Q. No.	Module 2	Marks
2. a	Explain about the errors in binary decision problems.	3
	Answer b or c	
b	Solve the decision problem with the following conditional probabilities using Bayes decision rule $P(z/m_1) = \frac{1}{2} e^{-\lvert z\rvert}$ $P(z/m_2) = e^{-2\lvert z\rvert}$ for $z>0$ and use the following costs $C_{11}=C_{22}=0$, $C_{12}=2$, $C_{21}=2$	6
c	Derive the expression for decision rules to detect a binary observation with different probability density functions using Min-Max criterion.	6

Q. No.	Module 3	Marks
3. a	Explain vector observation concept	3

Answer b or ç

b With neat sketches explain match filter receiver. 6

c Discuss about the General Gaussian problem. 6

Q. No.	Module 4	Marks
4. a	Differentiate between Estimation and Decision.	3

Answer b or c

b Discuss about the Linear minimum-variance method. 6

c Discuss about maximum likelihood estimation with an example. 6

Q. No.	Module 5	Marks
5. a	Briefly explain the concept of sequential estimation	4

Answer b or c

b Let θ be a three-dimensional Gaussian vector with mean $\mu = \begin{matrix}0\\0\\1\end{matrix}$ and variance $V_0 = \begin{matrix}1&0&0\\0&2&1\\0&1&1\end{matrix}$ The observation is given by $z = H\theta + n$, where $H = \begin{matrix}1&0&0\\0&1&0\end{matrix}$ and the noise is white and Gaussian with unit variance. Find the MAP estimate of θ. 8

c Explain about Nonlinear estimation. 8

Q. No.	Module 6	Marks
6.a	Explain Kalman filter	4

Answer b or c

b Explain the concept of unbiased estimators with an example 8

c Explain Asymptotic properties 8