Code No: C7504 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH I SEMESTER EXAMINATIONS, APRIL/MAY-2012
STATE AND PARAMETER ESTIMATION THEORY
(CONTROL SYSTEMS)

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

Answer any five questions
All questions carry equal marks

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1.(a) Explain the Maximum-Likelihood method for parameter estimation.
(b) Consider the following observations of a scalar parameter θ:
$z_i = \theta + n_i$; i=1,2, L
where the n_i's are independent and identically distributed Gaussian random variables with zero mean and variance σ^2. Estimate the parameter θ through Maximum – Likelihood method.

2.(a) Explain the Bays estimation criterion for parameter estimation.
(b) Find the minimum mean square estimator for the scalar parameter θ based on the scalar observation: $z = \ln\theta + n$
where $p(\theta) = \begin{cases} 1 & 0 \le \theta \le 1 \\ 0 & \text{otherwise} \end{cases}$ and $p(n) = \begin{cases} e^{-n} & n \ge 0 \\ 0 & \text{otherwise} \end{cases}$

3. Derive the necessary relations for parameter estimation using (i) conditional mode estimator and (ii) Maximum a posteriori estimator.

4.(a) Explain the relationship of estimators.
(b) Explain the procedure for parameter estimation using absolute value cost function.

5.(a) Explain the procedure of nonlinear estimation of parameters.
(b) Suppose that a message has probability density
$p(\theta) = \begin{cases} 1 & 0 \le \theta \le 1 \\ 0 & \text{otherwise} \end{cases}$ and
That it is observed by the observation $z = \ln\frac{1}{\theta} + n$
where the noise has probability density $p(n) = \begin{cases} e^{-n} & n \ge 0 \\ 0 & n < 0 \end{cases}$
Find the conditional mean estimate.

6.(a) Explain an efficient estimators and derive their relations.
(b) Explain asymptotic properties of estimators.

7.(a) With suitable diagram explain the Kalman filter and explain how it can be used for state estimation.
(b) Explain that identification as Kalman filtering problem.

8.(a) Explain what are modifications are to be done in Kalman filter to use it for nonlinear systems.
(b) Explain fixed point and fixed log smoothing.

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