No. of Printed Pages : 3

BIEEE-015

B.Tech. ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

December, 2013

01691

BIEEE-015 : STOCHASTIC CONTROL SYSTEMS

Time : 3 Hours *Maximum Marks : 70*

Note : *Attempt **any five** questions. All questions carries **equal** marks. Use of **scientific** calculator is allowed.*

1. Find the first order probability density $p(x;t)$ for random process **14**

$$x(t)=y(t)-2$$

Where y is a random variable with a probability density.

$$p_y(y) = \frac{1}{\sqrt{2\pi}} e^{-y^2/2} \quad -\infty \leq y \leq \infty$$

2. Show that if the two random variables X and Y are independent, then they are uncorrelated. Show also that the converse is not true in general, unless X and Y are both Gaussian. **14**

3. Let x be random variable and g : R→ R be a continuous and strictly monotonically increasing function. Show that g(x) is also a random variable defined on the same probability space. **14**

4. Suppose there is given a single- input signal model in completely reachable canonical form with. **14**

$$\begin{bmatrix} x^{(1)}_{k+1} \\ x^{(2)}_{k+1} \\ \vdots \\ x^{(n)}_{k+1} \end{bmatrix} = \begin{bmatrix} 0 & & \\ 0 & & I \\ \vdots & & \\ -a_1 & -a_2 \cdots & -a_n \end{bmatrix} \begin{bmatrix} x^{(1)}_{k} \\ x^{(2)}_{k} \\ \vdots \\ x^{(n)}_{k} \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ \vdots \\ 1 \end{bmatrix} W_k$$

show that it is possible to build a (state) fixed-log smoother of dimension 'N' where it is assumed that the fixed-lag is N and smoother is driven from kalman filter.

5. Show that a second order r.p is certainly first order, but the converse is not necessarily true. **14**

6. Write about the following and mention where these optimal smoothing being used. **14**

   (a) single- stage and double- stage smoothing

   (b) Fixed-Interval smoothing

   (c) Fixed-Point smoothing

   (d) Fixed-Lag smoothing.

7. Derive the separation principal theorem for the discrete time LQG optimal control problem of linear stochastic system. **14**

8. Write notes on **any two** of the following : **7x2=14**

(a) Stochastic optimal control for discrete linear system

(b) Stochastic optimal control for continuous linear system.

(c) Gauss- Markov process model

(d) Wiener filters.