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BIEEE-015

B.Tech. ELECTRICAL ENGINEERING (BTELVI)

Term-End Examination

June, 2013

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) of the random process $x(t) = \cos(W_c t + y)$ Where y is a random variable with probability density $P_y(Y) = \begin{cases} 1/2\pi & \text{for } 0 \le y \le 2\pi \\ 0 & \text{otherwise} \end{cases}$ **14**

2. Show that the output of a fixed-lag smoother driven from a Kalman filter with the smoother states instantaneously reset to zero (or some arbitrary values) at $k = j$ yield the correct fixed lag estimates for $k \geq j + N$. **14**

3. Show that a second order random variable is necessarily first order, but the converse need not be true. **14**

4. Verify that if F and G are two probability distribution function and $0 \leq \lambda \leq 1$, then $\lambda F + (1-\lambda) G$ is also a probability distribution function. 14

5. When is a filter optimal ? Write in detail about Bounded Optimal filter. 14

6. Consider a deterministic SISO LTI system of the form $y_{k+1} = ay_k + bu_k$
Where a and b are two unknown constants. Determine a and b, so that $\{u_k\}$ can be implemented on - line. 14

7. Write down four important characteristics of Basic filter and discuss each of these characteristics in detail. 14

8. Write notes on ***any two*** of the following : 7x2=14
   (a) Ballman dynamic programming method
   (b) LQG optimal controls
   (c) Gauss-Markov sequence model
   (d) Wiener Process