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R09

B.Tech II Year I Semester (R09) Supplementary Examinations June 2016

PROBABILITY THEORY & STOCHASTIC PROCESSES

(Common to EIE, E.Con.E & ECE)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

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1 (a) Three boxes of identical appearance contain two coins each. In one box are gold; in the second box are silver and in the third box one is silver and the other is gold. Suppose that a box is selected random and further that a coin in that box is selected at random. If this coin is gold what is the probability that the other coin is also gold.

(b) In a school 60% are boys and 40% are girls. Suppose that 20% and 25% of the girls and boys respectively play tennis. What is the probability that at randomly selected student is: (i) A girl who plays tennis? (ii) A boy who plays tennis? (iii) A tennis player?

2 (a) The distribution function of a random variable X is given by:

$F_x(x) = 1 - (1+x)e^{-x},\ for\ x \geq 0;$

= 0; otherwise.

Find the probability density function.

(b) State and prove any four properties of variance of random variable.

3 (a) A random variable defined by the density function

$F_x(x) = (\pi/6)\cos(\pi x/8);\ \ for - 4 \leq x \leq 4;$

= 0; elsewhere

Find E[3X] and E[X^2].

(b) List the properties of characteristic function.

4 X, Y are jointly continuous random variables with joint density function:

$f_{x,y}(x,y) = xy.\exp[(-1/2)(x^2+y^2)], x > 0, y > 0.$

Check whether X and Y are independent. Find $P(X \leq 1, Y \leq 1)$ and $P(X + Y \leq 1)$.

5 X is a random variable with mean = 3 and variance = 2. A new random variable Y = -6X + 22. Find whether X and Y are correlated or uncorrelated.

6 Two random variables Y_1, Y_2 are related to random variables X and Y by the following relation:

$Y_1 = X\cos\emptyset + Y\sin\emptyset;\ \ Y_2 = X\sin\emptyset + Y\cos\emptyset$

7 A random process X(t) is defined as X(t) = (A+2) Cos(t) + B Sin(t), where A and B are independent random variables with zero mean and same mean square value of 1. Verify that X(t) is stationary or not. Find its covariance.

8 (a) Find the power spectral density of a random process Z(t) = X(t) + Y(t), where X(t) and Y(t) are zero mean independent random process.

(b) Find the average power of a random process with power spectral density given as $S_{XX}(\omega) = 6\ \omega^2/(1+\omega^2)$.

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