PVP 14

Code: EC3T2

II B.Tech - I Semester–Regular/Supplementary Examinations
November 2016

PROBABILITY THEORY AND STOCHASTIC PROCESS
(ELECTRONICS AND COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

PART – A

Answer ***all*** the questions. All questions carry equal marks

11x 2 = 22 M

1.

a) Define Joint probability and conditional probability.
b) When two dice are thrown, find the probability of getting the sums of 10 or 11.
c) Write the expressions for density and distribution functions of an Exponential Random variable.
d) State any two properties of Characteristic function.
e) Give the relations between Jointy Density function and marginal density function.
f) If X and Y are independent random variables, show that E[XY] = E[X] . E[Y]
g) Define a Strict Sense Stationary random process.
h) Mention any two properties of power spectral density.
i) What is a Linear – time Invariant system? Given an example.
j) Define Noise Figure.
k) Define Noise power spectral density.

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

3 x 16 = 48 M

2.

a) Explain the axioms of probability and the theorem of total probability. 8 M

b) In a box there are 100 resistances having resistance and tolerance shown in below table. If a resistor is chosen with same likelihood of being chosen for the three events, A as “draw a 47 ohm resistor”, B as "draw a resistor with 5% tolerance", C as "draw a 100 ohm resistor”, determine joint probabilities and conditional probabilities.

Resistance(ohm)	Tolerance		
	5%	10%	Total
22	10	14	24
47	28	16	44
100	24	8	32
Total	62	38	100

8 M

3.

a) Explain Gaussian random variable with neat sketches.

8 M

b) A random variable ‘X’ can have value -4,-1, 2, 3, and 4 each with probability 1/5. 8 M

i. Find the density function
ii. The mean
iii. The variance of the random variable $Y = 3X^3$.

4.

a) Define conditional distribution and density function of two random variables X and Y. 8 M

b) Two statistically independent random variables X and Y have mean values E(X) = 2 and E(Y) = 4. Thus have second moments $E(X^2) = 8$ and $E(Y^2) = 25$. Find the mean values, the variance of the random variable W = 3X - Y. 8 M

5.

a) A random process is defined by $Y(t) = X(t)\cos(\omega_o t+\theta)$ where X(t) is WSS random process that amplitude modulates a carrier of constant angular frequency ω_o with a random phase θ independent of X(t) and uniformly distributed on $(-\prod,\prod)$. Is Y(t) a WSS random process. 8 M

b) State and prove the properties of power spectral density. 8 M

6.

a) A signal $x(t) = u(t)\exp(-\alpha t)$ is applied to a network having an impulse response $h(t) = W u(t) \exp(-Wt)$. Here α and W are real positive constants and u(.) is the unit step function. Find the system's response. 8 M

b) Define the following random process 8 M

(i) Band pass

(ii) Band limited

(iii) Narrow band