PVP 14

Code: EC3T2

II B.Tech - I Semester – Regular/Supplementary Examinations
November - 2018

PROBABILITY THEORY AND STOCHASTIC PROCESS
(ELECTRONICS & 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) State joint probability.
b) Define total probability.
c) Discuss about first and second moments of a random variable.
d) Discuss the probability distribution function with properties.
e) Define Normal distribution function and explain with relevant plots.
f) Given the function:

$$f_{XY}(x,y) = \begin{cases} b(x+y)^2 & -2 < x < 2, \; and \; -3 < y < 3 \\ 0 & elsewhere \end{cases}$$

Evaluate the constant b if it is a valid density function.
g) State Central Limit theorem.
h) Define mean and mean square of a random variable.

i) Discuss about the two dimensional Gaussian random variables density function.

j) Mention the properties of power spectral density.

k) Define the Response of the LTI system

PART – B

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

3 x 16 = 48 M

2. a) Discuss about Bay's theorem with detailed explanation. 8 M

b) State about independent events with an example. 4 M

c) David is writing an exam of multiple choice questions. It contains a total of 15 questions, each of which has 4 possible answers. What is the probability that David gets exactly 11 correct answers? 4 M

3. a) Sketch the Distribution and density function and also mention the applications of Uniform Distribution. 6 M

b) A random variable X has a probability density 6 M

$$f_X(x) = \begin{cases} \frac{\pi}{16}\cos\left(\frac{\pi x}{8}\right), & -4 < x < 4 \\ 0, & elsewhere \end{cases}$$

Find i) Mean value ii) Second moment iii) Variance.

c) Apply the concept of the moments of the random variable, determine the mean and variance of Poisson distribution & prove that it equals to average rate of outcome λ. 4 M

4. a) Write the equation for Joint density function and prove its properties. 4 M

b) Two Random Variables X and Y have a joint probability density function 6 M

$$f_{XY}(x,y) = \begin{cases} \frac{5}{16}x^2 y & 0 < y < x < 2 \\ 0 & elsewhere \end{cases}$$

i) Find the Marginal density function of X and Y.

ii) Are X and Y statistically independent.

c) Discuss about statistical independence of random variables. 6 M

5. a) Discuss the Wiener-Khintchine relation for auto power spectral density and autocorrelation of a random process. 6 M

b) If X(t) is WSS process, Develop the power spectrum of $Y(t) = A_0 + B_0 X(t)$ in terms of the power spectrum of X(t), if A_0, B_0 are real constants. 6 M

c) Define and explain stationarity of a random process X(t) and its types. 4 M

6. a) Derive the relationship between PSDs of input and output random processes of an LTI system. 4 M

b) A Random Noise X(t) having power spectrum

$S_{XX}(\omega) = \frac{3}{49 + \omega^2}$ is applied to a network for which

$h(t) = u(t)t^2 \exp(-7t)$. The network response is denoted by Y(t). 8 M

i) Compute the average power in X(t)

ii) Evaluate the power spectrum of Y(t)

iii) Find the average power in Y(t)

c) Deduce the expression for auto correlation function of system response. 4 M