

M. Tech. Electronics & Communication Engineering (CBCS Pattern) Semester-I  
**PECS11 - Probability Theory and Stochastic Processes**

P. Pages : 1

Time : Three Hours



**GUG/S/25/10978**

Max. Marks : 70

- Notes :
1. All questions carry marks as indicated.
  2. Assume suitable data wherever necessary.
  3. Illustrate your answers wherever necessary with the help of neat sketches.

1. a) Two players A and B draw balls one at a time alternatively from a box containing 'm' white balls and 'n' black balls. Suppose that the player who picks the first white ball wins the game, what is the probability that the player who start the game will win? 7
- b) A certain test for a particular cancer is known to be 95% accurate. A person submits to the tests and results are positive. Suppose that a person comes from a population of 100,000 where 200 people suffer from that disease. What can we conclude about the probability that person under the tests has that particular cancer. 7

2. a) Explain Binomial distribution. Evaluate first moment, second moment, skewness and kurtosis. 6
- b) If the random variable x has following distribution function: 8

X	-2	-1	0	1
P(X)	0.4	K	0.2	0.3

Find K and mean of X.

3. a) Explain Poisson distribution. Evaluate mean and variance for it. 7
- b) Describe the relationship between the various discrete type distributions. 7
4. An event A occurs in a series of independent trials with constant probability P. If A occurs at least 'r' times in succession, referred to as a sum of length 'r'. Find the probability of obtaining a run of length 'r' for A in a trial. 14

5. a) Explain Gamma distribution with its properties. 7
- b) Explain Weibull distribution with its properties. 7

6. Given:  $f(x) = \frac{x}{2}, 0 \leq x \leq 2$  14  
 $= 0, \text{ otherwise}$   
and  $g(y) = 2(1-y), 0 \leq y \leq 1$   
 $= 0, \text{ otherwise}$

Determine the function  $y(x)$ , which will transform  $f(x)$  into  $g(y)$ .

7. a) Suppose that  $x(t)$  is a normal process with  $x(t) = 3, c(t_1, t_2) = 4e^{-0.2|t_1-t_2|}$ . 8  
Find the probability that (i)  $X(5) \leq 2$  (ii)  $|X(8) - X(5)| \leq 1$
- b) Establish necessary and sufficient condition for the process  $x(t) = a \cos \omega t + b \sin \omega t$ . 6
8. a) Find the power spectral density of random variable  $X[n]$  whose autocorrelation function is given by  $R_{XX}[m] = a^{|m|}$ . 8
- b) What is distinction between Ergodic and Stationary process? Explain with examples. 6

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