A **Pages: 2**

Reg No.:_______________ Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

M.Tech S1 (R,S) Exam Dec 2020

Cluster: **Kollam**
Branch: **ECE**
Specialisation: **Communication Systems**

02EC6211 RANDOM PROCESS AND APPLICATIONS

Time: 3 hours Max.Marks:60

Instructions: *Answer **All** Questions from **Part A.***
*Answer **Two Full** questions from **Part B**.*

Part A

1. (a) Show that when 'n' is very large and 'p' very small, the binomial distribution can be approximated by Poisson distribution.

   (b) The pdf of a random variable, X is given by

   $f_X(x) = \frac{x}{20} \quad 2 \le x \le 5$

   Find the pdf of Y=3X-5

2. (a) If X and Y are independent and uniformly distributed RV in the interval (0,1). Find the distribution of Z=XY

   (b) Find the pdf of $Z=\sqrt{X^2+Y^2}$

3. (a) Prove the memoryless property of geometric distribution

   (b) Find MGF of exponential random variable. Determine the mean and variance of exponential random variable using MGF

4. (a) A Gaussian random variable with variance 10 and mean 5 is transformed to $Y= e^X$. Find the pdf of Y

   (b) Prove Chapman-Kolmogorov Equation **(4 x 9=36)**

Part B

5. A Random Process, X(t) whose mean value is 2 and autocorrelation is $R_{XX}(\tau)= 4e^{-2|\tau|}$ is applied to a system whose transfer function, $H(\omega) = \frac{1}{2+j\omega}$. Find the mean value, autocorrelation, power spectral density (PSD) and average power of output random process.

6. (a) Prove Chebyshev's inequality

   (b) Let $R_X(\tau)= e^{-\alpha|\tau|}$. Find orthonormal functions, $\{\phi_n(t)\}$ for series representation of random process, X(t) in $0<t<T$

7. Let X(t) =S(t) + N(t), where S(t) is the modulating signal and N(t) is Additive White Gaussian Noise (AWGN) with power spectral density $N_0/2$. Obtain the eigen values and eigen functions for Karhunen-Loeve (K-L) expansion of X(t).

(2 x 12=24)