

QP Code : 29160

Max. Marks: 100

Duration: 3 Hr.

Note: - Question number 1 is compulsory.
Solve any four from remaining questions.
Assume suitable data wherever necessary and state it clearly

- Q1a) State and explain central limit theorem (5)
- b) State the properties of probability density function of random variable. (5)
- c) State the axiomatic definition of probability. (5)
- d) Define WSS and SSS processes (5)
- Q.2 a) Given a continuous random variable X, uniform in the interval $(-C, C)$. Determine $E\{X\}$ and variance of random variable X. (5)
- b) Define random variable, explain with suitable example. Also define expected value and variance for continuous and discrete random variable. (10)
- c) A discrete random variable X takes a value 1 and 0 with the probability p and (1-p). Determine the expected value and variance of random variable X. (5)
- Q.3 a) State and prove the properties of autocorrelation and cross correlation function (10)
- b) The joint probability density function of (X,Y) is given by
 $f_{XY}(x,y) = C(1-x \cdot y)$ for $0 \leq x \leq 1$ and $0 \leq y \leq 1$ (10)
 find
 1. C
 2. $f_x(x)$
 3. $f_y(y)$
- Q4. a) Let X be a continuous random variable with probability density function in the interval $(0, 2\pi)$. Find the probability density function of $Y = \cos X$. (10)
- b) Define following terms in details (10)
 1. Independent random variable.
 2. Covariance
 3. correlation coefficient
 4. Orthogonality
 5. Uncorrelatedness
- Q5.a) A random process is given by $X(t) = A \cos(\omega_0 t + \phi)$, where A and ω_0 are constant and ϕ is uniform random variable in interval $(-\pi, \pi)$. Show that X(t) is WSS process (10)

- b) Explain power spectral density. State its important properties and prove any one property. (10)
- Q6 a) Derive Chapman-Kolmogorov equation. (10)
- b) Define random process with example. Define first and second order distribution and density function of a random process. (10)
- Q7) Write a short note on any four (20)
1. Sequence of random variable.
 2. Markov process.
 3. Joint and conditional probability.
 4. Ergodic process.
 5. Baye's theorem
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