Mahindra University Hyderabad

École Centrale School of Engineering
Minor-I Exam

SE23UCAM020

Program: B. Tech. **Branch: CM** **Year: II** **Semester: II**
Subject: Stochastic Processes (MA2213)

Date: 28/02/2025 **Start Time: 02:00 PM**
Time Duration: 1.5 Hours **Max. Marks: 20**

Instructions:

1) Answer all the questions.
2) All questions are self-explanatory; no clarification will be provided during the exam.
3) Use of scientific calculator is not allowed.

Course outcomes (COs)

CO 1: Apply stochastic processes for modeling time-evolving random events.

CO 2: Understand the existence of different types of limits, continuity, differentiability, and integrability.

CO 3: Apply and analyze stochastic filtering techniques and signal processing applications.

CO 4: Understand Markov processes and their applications.

Q.No.	Questions	Marks	CO	BL	PO	PI Code
1	Let $Y_n = g(n)X_n$ where X_n is a symmetric random walk process and $g(n)$ is a deterministic function of n. (i) Find the joint cdf of Y_n and Y_{n+1}. (ii) Find the cross-covariance function of X_n and Y_n.	5	CO1	L3	PO2	2.1.2
2	Let $X(t)$ be a zero-mean Gaussian random process with auto-covariance function given by $C_X(t_1, t_2) = 4e^{-2\|t_1 - t_2\|}$. Find the joint pdf of $X(t)$ and $X(t+s)$.	5	CO1	L2	PO2	2.1.2
3	Let $Z(t) = X(t) - aX(t-s)$, where $X(t)$ is the Wiener process. (i) Find the pdf of $Z(t)$. (ii) Find $m_Z(t)$ and $C_Z(t_1, t_2)$.	5	CO1	L5	PO2	2.1.2
4	Find $P[N(t-d) = j \mid N(t) = k]$ with $d > 0$, where $N(t)$ is a Poisson process with rate λ.	5	CO1	L3	PO2	2.1.2

P.T.O.