Reg. No. | | | | | | | | |

G. VENKATASWAMY NAIDU COLLEGE (AUTONOMOUS), KOVILPATTI – 628 502.

UG DEGREE END SEMESTER EXAMINATIONS - APRIL 2025.
(For those admitted in June 2021 and later)

PROGRAMME AND BRANCH: B.Sc., STATISTICS

SEM	CATEGORY	COMPONENT	COURSE CODE	COURSE TITLE
V	PART - III	CORE	U21ST509	STOCHASTIC PROCESSES

Date & Session: 25.04.2025/FN **Time: 3 hours** **Maximum: 75 Marks**

Course Outcome	Bloom's K-level	Q. No.	SECTION – A (10 X 1 = 10 Marks) Answer ALL Questions.
CO1	K1	1.	Which of the following distributions has the property that its mean is equal to its variance? a) Bernoulli b) Binomial c) Poisson d) Geometric
CO1	K2	2.	Stochastic Processes is a family of random variables indexed with a) time b) positive integers c) reals d) all
CO2	K1	3.	Markov chains that are under our considerations is of order a) 0 b) 1 c) 2 d) 3
CO2	K2	4.	In a Markov Chain, what is the Transition Probability Matrix used for? a) To calculate the mean and variance of the process. b) To represent the probabilities of moving from one state to another. c) To determine the stationary distribution of the chain. d) To generate random variables independent of the process.
CO3	K1	5.	Which of the following best describes a recurrent state in a Markov Chain? a) A state that can be visited infinitely often with a probability of 1. b) A state that can only be visited once. c) A state that cannot be reached from any other state. d) A state that leads to absorbing states.
CO3	K2	6.	Class property of states of markov chain a) persistent b) aperiodic c) transient d) all
CO4	K1	7.	A random selection from a poisson process is a) exponential b) binomial c) poisson d) normal
CO4	K2	8.	What distribution describes the number of events in a fixed interval of time for a Poisson process with rate λ? a) Geometric Distribution b) Exponential Distribution c) Normal Distribution d) Poisson Distribution
CO5	K1	9.	If one type of bird has lived for a long number of years with different generations then what will be the probability that it survives further: a) 1 b) 0.5 c) tends to zero d) zero
CO5	K2	10.	In branching process, if m>1, the probability of ultimate extinction is _____. a) the negative root less than unity of the equation b) the positive root less than unity of the equation c) the negative root greater than unity of the equation d) the positive root greater than unity of the equation

Course Outcome	Bloom's K-level	Q. No.	**SECTION – B (5 X 5 = 25 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	11a.	Explain stationary process. **(OR)**
CO1	K3	11b.	Describe about stochastic processes with example.
CO2	K3	12a.	State and prove Chapman-Kolmogorov equation. **(OR)**
CO2	K3	12b.	Explain the concept of independent Bernoulli trails sequence of chain dependent trails.
CO3	K4	13a.	Write about the graph theoretic approach in Markov chain. **(OR)**
CO3	K4	13b.	Explain the concept of higher transition probabilities in a Markov Chain.
CO4	K4	14a.	Analyse the relationship between Poisson process and Geometric distribution. **(OR)**
CO4	K4	14b.	Explain postulates for Poisson process.
CO5	K5	15a.	Interpret the branching process. **(OR)**
CO5	K5	15b.	Interpret the probability of Extinction.

Course Outcome	Bloom's K-level	Q. No.	**SECTION – C (5 X 8 = 40 Marks)** **Answer ALL Questions choosing either (a) or (b)**
CO1	K3	16a.	Explain the types of stochastic process. **(OR)**
CO1	K3	16b.	Derive the mean and variance for a Binomial distribution X~Binomial(n,p), and discuss its Probability Generating Function.
CO2	K4	17a.	Explain Polya's Urn Model. **(OR)**
CO2	K4	17b.	Explain the generalization of independent Bernoulli trials in the context of Markov Chains.
CO3	K4	18a.	State and prove the ergodic theorem. **(OR)**
CO3	K4	18b.	Determine the classification of states and chains.
CO4	K5	19a.	Analyse the Properties of Poisson process. **(OR)**
CO4	K5	19b.	State and prove Yule furry process.
CO5	K5	20a.	Interpret the properties of generating functions of the branching process. **(OR)**
CO5	K5	20b.	If $\{x_n\}$ is a Galton-Watson branching process with $x_0 = 1$,Obtain the variance of x_n.