

Roll.No.

20USTCT5012

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.

B.Sc.Statistics - END SEMESTER EXAMINATIONS - NOVEMBER 2025
SEMESTER - V

20USTCT5012 - Stochastic Processes

Total Duration : 2 Hrs.30 Mins.

Total Marks : 60

Section B

Answer any **SIX** questions ($6 \times 5 = 30$ Marks)

1. Define Markov chain. Give an example of an irreducible Markov chain.
2. Consider the process $X(t) = A_0 + A_1t + A_2t^2$ where A_0, A_1 and A_2 are uncorrelated random variables with mean 0 and variance 1. Find mean and variance functions and examine whether the process is covariance stationary
3. Draw a transition diagram for the following TPM.
$$\begin{bmatrix} 1/3 & 2/3 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 1/2 & 0 & 1/2 & 0 \\ 0 & 0 & 1/2 & 1/2 \end{bmatrix}$$
4. Define Poisson Process. Write down its postulates.
5. Differentiate strict sense and wide sense stationary process.
6. Explain the birth and death process and obtain the forward differential equations.
7. What are the operating characteristics of a Queuing system.
8. Define Transient state and steady state with illustrations.

Section C

Answer any **THREE** questions ($3 \times 10 = 30$ Marks)

9. State and prove Chapman –Kolmogorov equation for a Markov chain.
10. State and prove the additive property of Poisson process.
11. Explain the postulates of Yule-Furry process and find an expression for $P_n(t)$

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12. Consider (M/M/1) queuing model with queue discipline FIFO and infinite system capacity. Obtain the steady state probability that there is n customer in the system.
13. Explain the classification of the stochastic process based on time and state space with examples.
