



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc.DEGREE EXAMINATION – STATISTICS

THIRD SEMESTER – APRIL 2019

16/17PST3MC02/ ST 3816 – STOCHASTIC PROCESSES

Date: 09-04-2019
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

Section -A

Answer all the questions

10 X 2 = 20 marks

1. Define a stochastic process and give an example.
2. Define a transition probability matrix.
3. When a stochastic process is called Markov?
4. Define periodicity of Markov chain.
5. When a state of a Markov chain is called recurrent or transient?
6. Define a covariance stationary process.
7. Show that communication is an equivalence relation.
8. Define a renewal process.
9. State Abel's lemma.
10. Give two examples for branching process.

Section – B

Answer any five questions

5 X 8 = 40 marks

11. Explain (i) One dimensional random walk (ii) Spatially homogeneous Markov chains (4+4)
12. State and prove the necessary and sufficient conditions for a state to be recurrent.
13. Explain stationary probability distribution of a Markov chain.
14. Derive Yule process.
15. Show that the Poisson process can be viewed as a renewal process.
16. Explain supermartingales and submartingales.
17. For a branching process establish the relation for probability generating function.
18. Illustrate stationary process with two examples.

Section- C

Answer any two questions

2 X 20 = 40 marks

19. (a) State and prove the basic limit theorem of Markov chains.

(b) Show that the two dimensional random walk is recurrent **(12+8)**

20.(a) Derive $P_n(t)$ for Poisson process by clearly stating the assumptions.

(b) Derive a system of differential equations for a pure birth process. **(12 + 8)**

21.(a) Obtain the mean and variance of branching process.

(b) If q is the probability of eventual extinction, show that it satisfies the equation $\varphi(q) = q$.

(10 + 10)

22.(a) Explain two contrasting stationary processes and moving average processes.

(b) Illustrate martingales with two examples. **(10 +10)**

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