LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

THIRD SEMESTER – **APRIL 2014**

ST 3816/3812/3809 - STOCHASTIC PROCESSES

Date : 05/04/2014   Dept. No.   Max. : 100 Marks
Time : 01:00-04:00

Section-A

Answer all the questions.   **(10x2=20 marks)**

1) Define States space with an example.

2) State any two applications of Markov Chain.

3) Briefly explain the term TPM with an example.

4) Define Null recurrence.

5) Give an example for Periodicity.

6) What is meant by random walk?.

7) Define renewal process.

8) Briefly explain the term Martingale.

9) State the postulates of pure birth process.

10) State any two applications of Branching process.

Section-B

Answer any FIVE questions.   **(5x8=40 marks)**

11) Explain the applications of the Stochastic Processes in

   i) Social mobility and ii) Time-series problems.

12) Discuss the Gambler's Ruin problem with an example

13) Explain the following with an example i) Symmetry and ii) Transitivity of states

14) What is meant by stationary distribution? Explain any two applications..

15) Explain renewal process as counting process with illustration.

16) Derive the total mean life of renewal process.

17) Show that the probability of eventual extinction 'π' is the smallest positive root of the

   equation- **Φ (s) =** s.

18) Explain Two type Branching with illustration.

Section-C

19 a) Discuss in detail the four classifications of the Stochastic Processes with suitable

   illustrations.

  b) Derive the differential equations for a pure birth process.   (10+10 marks)

20a) Show that a Markov Chain is fully determined, when its initial distribution and one step

   transition probabilities of the Markov chain are known.

 b) Explain the brand switching problem and construct the TPM.   (12+8 marks)

21a) Explain the real life applications of branching process and derive the mean and variance of

   the discrete time branching process with $X(0) = 1$.   .

 b) Given $\Phi(s) = p_0 + p_2 s^2$ ($0 < p_0 < 1$, $p_0 + p_1 = 1$), that is the probability generating function

   corresponding to a branching process in which each generation an individual either dies or

   replaced by two progeny. Find 'π' , which is the smallest positive root of the

   equation $\Phi(s) = s$.

                                                                                        (12+8marks)

22) Write short notes on the following

    a) Excess life and current life.

    b) Poisson   Process

    c) Renewal theorem

    d) Continuous time Markov chain   (5+5+5+5 marks)

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