LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**B.Sc.** DEGREE EXAMINATION – **STATISTICS**

FIFTH SEMESTER – **NOVEMBER 2012**

# ST 5400 - APPLIED STOCHASTIC PROCESSES

Date : 10/11/2012 Dept. No. Max. : 100 Marks

Time : 9:00 - 12:00

**Section-A**

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

1. Give an example for one and two dimensional Stochastic Processes.
2. Define Time space with an example.
3. Define Null recurrence.
4. What is meant by Periodicity?
5. Briefly explain the term random walk.
6. Define the term communication of the states.
7. What is meant by absorbing state?
8. What is meant by TPM?.
9. Define Markov Chain.
10. What is meant by Birth process

**Section-B**

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

11)Discuss in detail the classifications of the Stochastic Processes.

12) Distinguish between Symmetry and Transitivity of communication with an example.

13) Discuss in detail any two applications of Stochastic modeling. **.**

14) Explain the Gambler’s Ruin problem with an example.

15)Discuss the applications of stationary distribution with suitable illustration.

16) Discuss in detail the higher order transition probabilities with suitable illustration.

17) A white rat is put into the maze consisting of 9 compartments. The rat moves through the

compartment at random. That is there are k ways to leave a compartment. The rat chooses each of the

move with probability1/k.

a) Construct the Maze

b)The Transition probability matrix

18) Discuss the Social Mobility problem.

**Section-C**

**Answer any TWO questions: ( 2x20=40 marks)**

19a) Show that a Markov Chain is fully determined, when its initial distribution and one step transition

probabilities of the Markov chain are known.

19b) State and prove Chapman-Kolmogrov equation.

20) Sociologist often assumes that the social classes of a successive generation in a family can be regarded as a Markov chain. The TPM of such model is as follows.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Son's Class | | | |
|  |  | Lower | Middle | Upper |
|  | Lower | 0.4 | 0.5 | 0.1 |
| Father's Class | Middle | 0.05 | 0.7 | 0.25 |
|  | Upper | 0.05 | 0.5 | 0.45 |

Find

1. What proportion of people are lower class in the long run?
2. What proportion of people are middle class in the long run?
3. What proportion of people are upper class in the long run?

21a) Explain the one dimensional random walk problem with the TPM .

21b) If the probability of a dry day (state-0) following a rainy day (state-1)is 1/3, and that of a rainy day following a dry day is ½. Find i) Probability that May 3 is a dry day given that May first is a dry day. ii) Probability that May 5 is a rainy day given that May first is a dry day..

22) Write short notes on the following

a) Poisson Process

b) Irreducible Markov Chain

\*\*\*\*\*\*\*\*\*\*