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FIFTH SEMESTER **B.Tech. Mathematics & Computing**

SUPPLEMENTARY EXAMINATION, Feb 2019

Code & Title: MC 303 Stochastic Processes

Time: 3:00 Hours

Max. Marks : 40

Note : Answer all question by selecting any two parts from each questions. All questions carry equal marks. Assume suitable missing data, if any.

1[a] Differentiate between a random variable and a random process. Classify a stochastic process based on its state and parameter with an example of each type and graphical representation.

[b] What is a Poisson process? Give example. State its important properties. Show that it is a Markov process.

[c] Describe birth and death process and find its steady state solution.

2[a] Describe random walk with two absorbing barriers. Show that the probability that the particle continues to move indefinitely between the two such barriers is zero.

[b] Show that in case of an unrestricted simple random walk, if the probability of a jump upward is greater than the probability of a jump downward, then the particle will drift to ∞ with probability one.

[c] Describe a random walk of your choice with finite number of states with one absorbing barrier and one reflecting barrier. Consider suitable values of the different parameters and find the probability of absorption.

3[a] Explain Bernoulli process? Give examples, both of homogeneous and non homogeneous.

[b] Explain ergodic Markov chain. Consider an ergodic Markov chain of your choice and find the steady state probability distribution for that. What is its significance ?

- [c] Two gamblers having an equal probability of loss or gain of Rs 1 at a time, start a game with a fortune of Rs 3 each. If at any stage a specific gambler is having fortune of Rs 4 then find the probability of losing all his fortune by the next 8 trials.
- 4[a] What's a renewal process. Give example. Consider a renewal counting process with a renewal function of your choice. Find the probability distribution of the number of renewals by a specific time of your choice.
- [b] A service centre opens at 9 AM. From 9 AM until 3 PM customers arrive at a Poisson rate of four per hr. and from 3 PM until 9 PM arrival is at a Poisson rate of 6 per hr. Find the probability distribution of the number of customers entering the store on a given day. Also the mean and variance for the same.
- [c] Define a Markov chain. Give example. How do you find n-step transition probability matrix of a Markov chain; explain by considering a suitable example.
- 5[a] Describe M/M/1 queuing system. Find the expected numbers in the queue, and in the system.
- [b] Find the probability of losing a customer in M/M/c/c queue model by considering suitable values of the various parameters.
- [c] In a railway yard goods trains arrive at the rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time distribution is also exponential with an average of 36 minutes then find the (i) mean queue size, (ii) probability that the queue size exceeds 10, (iii) mean number of trains departed per busy period.