THIRD SEMESTER M.Sc. DEGREE EXAMINATION, OCTOBER 2017
(Regular/Supplementary/Improvement)
(CUCSS - PG)
CC15P ST3 C11 - STOCHASTIC PROCESSES
(Statistics)
(2015 Admission Onwards)

Time : Three Hours   Maximum : 36 Weightage

Part A
Answer *all* questions
(Weightage 1 for each Question)

1. Define a stochastic process. How it is classified based on the nature of the index set and state space.

2. Differentiate between transient and recurrent state of a Markov chain.

3. Define periodicity of a Markov chain with an example.

4. Distinguish between a wide sense and strict sense stationary process.

5. Explain how a pure birth process is different from a Poisson process.

6. Define a renewal reward process.

7. Define an M/M/1 queuing process.

8. What you mean by steady state distribution of a Markov chain?

9. Define a one dimensional random walk.

10. Write the postulates of a Poisson process.

11. Is Brownian process an example of a stationary process. Justify your answer.

12. Explain regenerative processes.

(12 x 1 = 12 Weightage)

Part B
Answer *any eight* questions
(Weightage 2 for each Question)

13. Establish Chapman Kolmogorov equation associated with a Markov chain. What is its significance?

14. In an irreducible chain show that all the states are of the same type.

15. Explain Polya's urn scheme.

16. Establish that recurrence is a necessary and sufficient condition for the existence of stationary distribution, in case of an a periodic Markov chain.

17. Show that two dimensional symmetric random walk is a recurrent chain.

18. Define renewal equation. Show that a renewal equation is satisfied by a renewal function.

19. Discuss how Poisson distribution is related to uniform distribution.

20. Derive the forward differential equation satisfied by a birth and death process.

21. Describe a linear growth process with immigration.

22. Explain how Brownian motion process can be considered as the limit of a random walk.

23. Derive recurrence relation satisfied by the pgf of the offspring distribution of a branching process.

24. State and prove elementary renewal theorem.

(8 x 2 = 16 Weightage)

Part C

Answer *any two* questions

(Weightage 2 for each Question)

25. Establish an necessary and sufficient condition of a state of a Markov chain to be transient. Examine the nature of states of a 3-dimensional random walk.

26. Establish the condition for probability of extinction of a branching process to be unity. Also bring out the connection between branching process and martingale.

27. Derive the steady state distribution of an M/M/1 Queuing system. Also derive the waiting time distribution.

28. Explain Yule-Furry process. Find its probability distribution. Hence or otherwise find its mean and variance.

(2 x 4 = 8 Weightage)

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