15P354 (Pages:2) Name……………………..

Reg. No………………..

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2016

(CUCSS - PG)

(Statistics)

CC15P ST3 C11 - STOCHASTIC PROCESSES

(2015 Admission)

Time : Three Hours Maximum : 36 Weightage

Part A

Answer ***all*** questions

(Weightage 1 for each Question)

1. Define the state space and index set of a stochastic process.
2. When do you say that state of a Markov chain is transient?
3. Differentiate between a strict sense stationary and wide sense stationary process.
4. Define a one dimensional random walk.
5. Explain the renewal function and renewal density associated with a renewal process.
6. Give the TPM of a finite Markov chain with one absorbing state and all other states being transient.
7. Outline the basics of a queuing process.
8. Briefly discuss a delayed renewal process.
9. Explain the significance of Little's formula in queuing theory.
10. What is semi Markov process?
11. What are the postulates of a Poisson process.
12. Define a discrete time branching process.

(12 x 1 = 12 Weightage)

Part B

Answer ***any eight*** Questions

(Weightage 2 for each Question)

13. Show that a Markov chain is completely determined by its transition probability and initial probability distribution.
14. Define periodicity. Show that it is a class property.
15. Show that states of a one dimensional symmetric random walk are recurrent.
16. Derive the differential equation satisfied by a Poisson process.
17. Discuss the relation between Poisson process and binomial distribution.
18. Establish a necessary and sufficient condition satisfied by the recurrence a state of a Markov chain.
19. Derive the backward differential equation satisfied by a birth and death process.

20. Explain the terms current life and excess life associated with a renewal process.
21. Derive distribution of Brownian motion process from a random walk.
22. Describe a linear growth process with immigration.
23. Show that sum of two independent Poisson process is again a Poisson process.
24. Establish the recurrence relation satisfied by the probability generating function associated with the offspring distribution of a Branching process.

(8 x 2 = 16 Weightage)

Part C

Answer ***any two*** questions

(Weightage 4 for each Question)

25. a) State and prove ergodic theorem of Markov chain.
    b) Describe a gamblers ruin problem. Derive extinction probabilities.
26. Explain Yule-Furry process. Find its probability distribution. Hence or otherwise find its mean and variance.
27. Derive system of differential equation satisfied by an M/M/1 queuing system. Also find the steady state probabilities.
28. State and prove elementary renewal theorem. Discuss the application of renewal with respect to total life of a system.

(2 x 4 = 8 Weightage)

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