B.Sc. DEGREE EXAMINATION,APRIL 2020
III Year VI Semester
Stochastic Processes

Time : 3 Hours **Max.marks :60**

Section A $(10 \times 1 = 10)$ Marks

Answer any **TEN** questions

1. How a random process is different from a random variable?
2. Define jointly wide sense stationary process.
3. Define transition probability matrix.
4. Define absorbing barrier.
5. State the auto correlation of the Poisson process.
6. State the relation between uniform & poisson process.
7. Show the balanced equations of birth and death process using state transition diagram.
8. What is a linear growth process?
9. State the basic characteristics of the queuing system.
10. Define transient and steady state.
11. Define process with independent increment.
12. State the Kendall's notation of queuing models.

Section B $(5 \times 4 = 20)$ Marks

Answer any **FIVE** questions

13. Classify the random process with suitable examples.
14. A raining process is considered as two – state Markov chain. If it rains, it is considered to be in state 0 and if it does not rain, the chain is in state 1. The transition probability matrix of the Markov chain defined as $\begin{bmatrix} 0.6 & 0.4 \\ 0.2 & 0.8 \end{bmatrix}$

    (i) Find the probability that it will rain after three days from today, if it rains today.

    (ii) Find also the unconditional probability that it will rain after three days with initial probabilities of state 0 and state 1 as 0.4 and 0.6 respectively.
15. List the postulates of the Poisson process.
16. Explain pure birth process.

17. Derive the probability density function of the waiting in the system.
18. Show that the process $\{X(t)\} = A \cos(\omega t+\theta)$ is not stationary process where A and ω are constants and θ is uniformly distributed random variable in $(0,\pi)$.
19. Prove that the sum of two independent Poisson process is also a Poisson process.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Show that the process $\{X(t)\} = A \sin(\omega t+\theta)$ is a Wide Sense Stationary (WSS) process where A and ω are constants and θ is uniformly distributed in $(0,2\pi)$.
21. State and prove the Chapman – Kolmogrov theorem for discrete state discrete time Markov chain.
22. Prove that the inter – arrival time between two successive occurrences of a Poisson process with parameter λ follows an exponential distribution with mean $\frac{1}{\lambda}$.
23. For a pure birth process, prove that the transition probability of starting with 1 individual to reach j individuals is distributed as Geometric distribution.
24. At a railway station, only one train is handled at a time. The railway yard is sufficient only for 2 trains to wait while the other is given signal to leave the station. Trains arrive at the station at an average rate of 6 per hour and the railway station can handle them at an average of 6 per hour. Assuming Poisson arrivals and exponential service distribution, find the probabilities for the number of trains in the system. Also find the average waiting time of a new train coming into the yard. If the handling rate is doubled, how will the above results get modified?

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18. Show that the process {X(t)} = A cos (ωt+θ) is not stationary process where A and ω are constants and θ is uniformly distributed random variable in (0,π).
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