SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai — 600 044.
B.Sc. END SEMESTER EXAMINATIONS NOVEMBER-2022
SEMESTER - V
20USTCT5012 - Stochastic Processes

Total Duration : 2 Hrs 30 Mins.   **Total Marks : 60**

Section A

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Illustrate Stationary random process.

2. Sketch the state flow diagram of a Markov chain having states (1, 2, 3) with respective probabilities p_{12}, p_{13}, p_{21}, p_{23}, p_{31}, p_{32}.

3. List the postulates of Poisson process.

4. Explain linear growth process.

5. Classify the queueing models.

6. Relate random process with random variable.

7. Classify the state of a Markov chain.

8. List the operating characteristics of the queueing system.

Section B

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Classify stochastic process according to Index set and State space with suitable examples.

10. The Transition Probability Matrix of a Markov Chain with three states 0,1,2 is
$P = \begin{bmatrix} 3/4 & 1/4 & 0 \\ 1/4 & 1/2 & 1/4 \\ 0 & 3/4 & 1/4 \end{bmatrix}$ and the initial stat distribution of the chain is
$P[X_0=i]=\frac{1}{3}$; i=0,1,2 Compute
(i) $P(X_2 = 2)$
(ii) $P(X_3= 1, X_2= 2, X_1= 1, X_0= 2)$
(iii) $P(X_2= 1, X_0= 0)$

11. Justify that the inter arrival time between two successive Poisson arrivals distributed exponentially with mean $1/\mu$.

Contd...

12. Ascertain the distribution of the Yule – Fury (Pure Birth Process) process starting with i individuals to reach the size j

13. Consider a self-service store with one cashier. Assume Poisson arrivals and exponential service times. Suppose that 8 customers arrive on an average every 5 minutes and the cashier can serve 10 in 5 minutes. Evaluate:
    (i) The average number of customers queueing for service
    (ii) Average number of customers in the queue or queue length
    (iii) Average time a customer spends in the system
    (iv) Average time a customer waits before being served

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