



Seat No. \_\_\_\_\_

**HAM-003-1173004**

**M. Sc. (Sem. III) (CBCS) (Theory) Examination**

**June - 2023**

**MS-304 : Statistics**

*(Stochastic Process)*

**Faculty Code : 003**

**Subject Code : 1173004**

Time :  $2\frac{1}{2}$  / Total Marks : 70

**Instructions :**

- (1) Attempt all questions.
- (2) Each question carries equal marks.

**1** Answer the following questions :” (any seven) **14**

- (1) Total probability of pure birth process is \_\_\_\_\_.
- (2) Mean of Pure Birth Process is \_\_\_\_\_.
- (3) Probability mass function of Yule-fury birth process is \_\_\_\_\_.
- (4) A pure Birth process follows which distribution ?
- (5) The probability mass function of Poisson process follows which distribution and what is the parameter of that distribution ?
- (6) Define Non-Recurrent state.
- (7) Define Random Walk Model.
- (8) Define ergodic chain.
- (9) Define Stationary Process.
- (10) Define Markov Process.

**2** Answer the following questions : (any two) **14**

- (1) Explain Decomposition theorem of a Poisson Process.
- (2) Explain Postulates of Poission Process.
- (3) Define Markov Process in detail.

- 3** Answer the following questions : **14**
- (1) Discuss Chapman Kolmogorov equation.
  - (2) Let  $Px = P(1-p)x, x \geq 0$  such that...

$$S = \begin{cases} \frac{p}{1-p}; & \text{if } p \leq \frac{1}{2} \\ 1; & \text{if } S_2 = 1 \end{cases} \quad \text{if } S_1 = \frac{p}{q}$$

**OR**

- 3** Answer the following questions : **14**
- (1) Define Branching Process in detail.
  - (2) Find mean and variance of branching process.

- 4** Answer the following questions : (any two) **14**
- (1) Classify all the chain and states. Explain any one chain and one state.
  - (2) Explain Gambler's ruin problem.
  - (3) Prove that if  $i \leftrightarrow j$  that is  $i$  and  $j$  are communicative. If  $i$  is recurrent (Persistent) then  $j$  is also recurrent (Persistent).

- 5** Answer the following questions : (any two) **14**
- (1) Prove that conditional probability of Poisson process gives binomial distribution.
  - (2) Explain one dimensional random walk.
  - (3) Explain Galton-Watson branching process.
  - (4) What is meant by probability transition matrix ? Explain Morkov's chain.