

# Assgignment 1

## MC 303 Stochastic Process (2022-23)

1. Describe non-homogenous Bernoulli process. Derive its probability distribution. Is it also a Markov Process? Prove your claim. Show that when trials becomes homogeneous PDF reduces to that of homogeneous.
2. Describe homogenous Poisson process. What's its probability distribution? Show that it is a Markov process. What about non-homogeneous Poisson Process? Show that when arrival rate is independent of the state of the system time, then the PDF of non-homogeneous reduces to that of homogeneous Poisson process.
3. Describe pure death process. Derive its differential-difference equation and find the probability distribution of the number of departures at time  $t$ .
4. Derive the distribution function of the sum of  $n$  identically and independently distributed exponential random variables each with parameter  $\lambda$ .
5. Describe the following processes giving an example of each:
  - (a) Gaussian process,
  - (b) Stationary process,
  - (c) Brownian motion
- (6) Show that in case of unrestricted random walk if  $p < q$ , where the letters have their usual meanings, ultimately the particle drifts to minus infinity.
- (7) Describe random walk with two absorbing barriers find the probability that the particle gets absorbed at a specific barrier.
- (8) Give example of a random walk with two reflecting barriers. Show that limiting distribution is truncated geometric distribution. Explain the cases  $p <, >, = q$ .