**PROBABILITY DISTRIBUTIONS**

**BINOMIAL DISTRIBUTION:** Let A be some event associated with a random experiment E, such that P(A)=p and P(A1)=1-p=q, assuming that p remains the same for all repetitions, if we consider ‘n’ independent repetitions of E and if the random variable X denotes the number of times the event A has occurred, the X is called a binomial random variable with parameters n and p or we say that X follows a binomial distribution with parameters n and p or B(n, p ). Here X can take the values 0, 1, 2, 3,…., n .

*P*(*X*  *r*) *nC pr qnr* ;*r*  0,1,2,3,..,*n* and where ,p + q = 1.

*r*

\*Mean of the Binomial Distribution is ‘np’ and variance is ‘npq’.

**POISSON DISTRIBUTION:** If X is discrete RV that can assume the values 0,1,2,…such that its probability

*e* *r*

mass function is given by

*P*(*X*  *r*) ; where r=0,1,2,…; >0 then X is said to follow a Poisson

*r*1

distribution with parameter or symbolically ‘X’ is said to follow P( ).

\* *P*(*x*  *r*) 1

*r* 0

\*Poisson Distribution is limiting form of Binomial Distribution.

\*Mean of Poisson Distribution = Variance of Poisson Distribution=

**Normal Distribution:** A continuous RV X is said to follow a normal distribution or Gaussian distribution with parameter and , if its probability density function is given by,

(*x* )2

*f* (*x*) 1 *e*

2 2 ; *x*, ,

2

\*Symbolically ‘X’ follows N( , ).

\* *f* (*x*)*dx*  1,

\*If X has distributiion N( , ) and if Z=  *X*  , then we have Z has distribution N(0,1).

\*If X follows N( , ), then mean= and Variance= 2

**Normal Probability curve:**

The graph of y=f(x), for is a well-known bell shaped curve an is called the normal probability curve

Properties:

1. The curve is symmetrical about the ordinate at x= .

2. The ordinate f(x) decreases rapidly as x increases numerically.

3. The curve extends up to infinity on either side of x= and the x-axis is an asymptote to the curve.

4. The graph is concave downward at x= and it is concave upward for large numerical values of x.

5. If is relatively large, the curve tends to be flat, while if is small, the curve tends to be peaked.

**Uniform Distribution:**

A continuous RV X is said to follow a uniform or rectangular distribution in any finite interval, if its pdf is a constant in that interval.

\*If X follows a uniform distribution in a<x<b, then f(x)=1/b-a.

\*If X follows uniform distribution then Mean=(b+a)/2.

\*Variance = (b-a)2/12.

**Exponential Distribution:**

A continuous RV X is said to follow an exponential distribution if its pdf is f(x) =

*ex* , *x*  0

0,*otherwise*

\*Mean and Variance of the Exponential Distribution =1/

\*Variance of Exponential Distribution = 1/ 2

\*Memoryless property of the Exponential Distribution is P(X>s+t/X>s)=P(X>t), for any s,t>0.