Seat No. : _______________

MF-105

May-2018

B.Sc., Sem.-IV

CC-204 : Statistics
(Random Variable and Prob. Distribution-II)

Time : 3 Hours] **[Max. Marks : 70**

1. (a) Define characteristic function. Obtain the relation between r^{th} raw moment and characteristic function.

OR

State and prove Inversion theorem.

(b) State and prove Bool's inequality.

OR

If $\phi(t) = \dfrac{\sin t}{t}$ find $f(x)$.

2. (a) Define normal distribution. Show that all odd order central moments of normal distribution are zero. Also obtain even order central moments of normal distribution.

OR

Obtain mean and variance of Gamma distribution with parameters a and n.

(b) Define two parameter Weibull distribution. Obtain the expression for r^{th} moment of Weibull distribution. Hence determine its mean and variance.

OR

Show that difference of two independent normal variates is also normal variate.

3. (a) Define bivariate discrete distribution. Define marginal and conditional distributions for bivariate discrete distribution.

OR

With usual notation, show that two independent random variables are uncorrelated but the converse of this may not be true.

(b) With usual notation prove that :

(i) $E[E(X|Y)] = E(X)$

(ii) $E[E(X^2|Y)] = E(X^2)$

(iii) $V(X) = E[V(X|Y)] + V[E(X|Y)]$

OR

Let the joint distribution of x and y be as under obtain marginal distribution for x, marginal distribution for y, conditional distribution for $x|y$ and conditional distribution for $y|x$. $f(x, y) = 2 - x - y,\ 0 \leq x \leq 1,\ 0 \leq y \leq 1$.

4. (a) Define Markov chain with stationary assumptions, also define transition probability matrix.

OR

In small town 90% of all sunny days are followed by sunny days and 80% of all cloudy days are followed by cloudy days. Use this information to model small town's weather as a Markov chain. Find three step transition probability matrix and interpret the result.

(b) Explain steady state condition. Explain the use of Markov chain for predicting sales-force needs.

OR

The purchase patterns of two brands of toothpaste can be expressed as a Markov process with the following transition probability :

	Formula X	**Formula Y**
Formula X	0.9	0.1
Formula Y	0.05	0.95

(i) Which brand appears to have loyal customers ? Why ?

(ii) What are the projected market share for the two brands ? (Steady State)

5. Write answers in short :

(i) State pdf and characteristic function for Bn (n, p).

(ii) State pdf and characteristic function for standard normal distribution.

(iii) Give additive property of Gamma distribution.

(iv) State mean and variance of Weibull distribution.

(v) Explain irreducible Markov chain.

(vi) What is the correlation co-efficient of two independent random variables ?

(vii) Give two assumptions of first order Markov process.
