TD-103

May-2013

B.Sc. (Sem.-IV)

204 : Statistics

(Random Variable and Prob. Distribution-II)

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

Instructions : (1) **All** questions carry equal marks.

(2) Scientific calculator can be used.

1. (a) Define characteristics function and explain its properties.

OR

State and prove Inversion Theorem.

(b) State and prove Bool's inequality.

OR

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

2. (a) Obtain mean and variance of gamma distribution with parameters a, n.

OR

Obtain median and mode of the Weibull distribution with parameters α, β.

(b) With usual notation for normal distribution prove that

$$\mu_{2r} = \frac{\sigma^{2r}\,(2r)!}{2^r\,r!}$$

OR

Show that the difference of two independent normal variate is also a normal variate.

3. (a) Define :

(i) Joint pdf

(ii) Marginal pdf

(iii) Conditional pdf in terms of two continuous random variate X and Y. Also give condition for independence for two random variables.

OR

(a) $f(x, y) = \begin{cases} 2 - x - y & ; \quad 0 \le x \le 1, 0 \le y \le 1 \\ 0 & ; \quad \text{otherwise} \end{cases}$

Find :

(i) Marginal pdf of x and y

(ii) Conditional pdf of x/y and y/x

(b) With usual notation prove that

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

(ii) $V(X) = E(V(X|Y)) + V(E(X|Y))$

OR

Let $f(x - y) = 8xy$; $0 < x < y < 1$

$\qquad\qquad = 0$; elsewhere

Calculate $r(x \cdot y)$.

4. (a) Explain Markov chain with stationarity assumption, 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 probabilities.

Formula Formula

	X	Y
Formula X	0.90	0.1
Formula Y	0.05	0.95

(i) Which brand appears to have most loyal customers ? Explain.

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

5. (i) Give Chapman – Kolmogrove equation.

(ii) Give correlation coefficient for two independent random variables.

(iii) Give Mean and Variance of Weibull distribution.

(iv) Give product moment formula for correlation coefficient in terms of mathematical expectation.

(v) Explain ergodic Markov Chain.

(vi) State the ch. Function of Binomial and Poisson distribution.

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

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