129 (Pages : 4) Name..............................

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# SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2012

(CCSS)

Statistics—Complementary Course

ST 2C 02—PROBABILITY DISTRIBUTION

Three Hours Maximum : 30 Weightage

Answer *all* 12 questions :

1 The joint cumulative distribution function $F(x, y)$ lies within the limits.

(a) –1 and 1. (b) –1 and 0.

(c) $-\infty$ and $+\infty$. (d) 0 and 1.

2 $P\{X \le a, Y < b\} = P\{X < a, Y \le b\}$ provided.

(a) X and Y are discrete random variables.

(b) X and Y are continuous random variables.

(c) X and Y are independent random variables.

(d) X and Y are dependent random variables.

3 If X and Y are independent random variables, then

(a) $P\{X \le x, Y \le y\} = P\{X \le x\} P\{Y \le y\}$.

(b) $E(XY) = E(X) \cdot E(Y)$.

(c) $Cov(X, Y) = 0$.

(d) All the above.

4 The $(1, 1)^{th}$ product moment $\mu_{11}$ of a bivariate distribution is called.

(a) Coefficient of Correlation. (b) Coefficient of determination.

(c) Covariance. (d) None of these.

5 $E\{E(X|Y)\} =$

(a) Zero. (b) one.

(c) $E(X|Y)$. (d) $E(X)$.

Turn over

6 If X and Y are independent binomial $B\left(3, \frac{1}{4}\right)$ variates, then $Z = X + Y$ follows :

(a) $B\left(6, \frac{1}{2}\right)$.
(b) $B\left(3, \frac{1}{2}\right)$.
(c) $B\left(6, \frac{1}{4}\right)$.
(d) $B\left(3, \frac{1}{4}\right)$.

7 Variance of a discrete uniform distribution over the range [1, 11] is :

(a) 3.
(b) 6.
(c) 10.
(d) None of these.

8 If X has density $f(x) = \lambda e^{-\lambda x}, x > 0, \lambda > 0$, then $E\left(X^2\right)$ is :

(a) $\lambda^2$.
(b) $\frac{1}{\lambda^2}$.
(c) $2\lambda^2$.
(d) $\frac{2}{\lambda^2}$.

9 Gamma distribution G $(\alpha)$ is :

(a) Leptokurtic.
(b) Mesokurtic.
(c) Plattikurtic.
(d) Leptokurtic when $\alpha > 1$.

10 If $X_1$ and $X_2$ are independent standard normal variates, $E\left(X_1 - X_2\right)^2$ is :

(a) 0.5.
(b) 0.
(c) 1.
(d) 2.

11 If X is a standard normal variate, the value of $t$ for which $P\{|X| > t\} = 0.05$ is :

(a) 1.645.
(b) 1.96.
(c) 1.98.
(d) 2.34.

12 The income of people exceeding a certain limit follows :

(a) Cauchy.
(b) Lognormal.
(c) Pareto.
(d) Beta.

(12 × ¼ = 3 Wei

II. Short answer type questions. Answer *all* 9 questions.

13 Define cumulative distribution function of a bivariate random vector (X, Y).

14 Define conditional probability density function of Y given X.

15 Define conditional expectation in discrete case.

16 Define mathematical expectation of a bivariate random vector.

17 State the lack of memory property of geometric distribution.

18 Find the moment generating function of a degenerate distribution.

19 Define standard exponential distribution.

20 State the additive property of gamma distribution.

21 Define Pareto distribution.

(9 × 1= 9 weightage)

III. Short essay or paragraph questions. Answer any *five* questions.

22 Let $f(x,y)=\begin{cases}2, & 0<x<1;0<y<x\\ 0, & \text{otherwise.}\end{cases}$

check whether X and Y are independent.

23 For a distribution with joint probability density function

$$f(x,y)=\begin{cases}x\,e^{-x(1+y)} & , x\geq 0;y\geq 0\\ 0 & , \text{elsewhere,}\end{cases}$$

Find E (Y) and E (XY).

24 Obtain an expression for variance of a random variable X in terms of conditional variance.

25 Derive the moment generating function of a rectangular distribution over $[-a,a]$. Hence obtain its variance.

26 Obtain the mode of a Poisson distribution.

27 Derive an expression for mean deviation about mean of normal distribution.

28 For a distribution with probability mass function $p(x)=2^{-x}, x=1,2,\ldots,$ Obtain a lower bound to the probability $p\{|X-2|\leq 2\}$, by using Chebychev's inequality.

(5 × 2 = 10 weightage)

IV. Essay questions. Answer any *two* questions.

29 Three coins are tossed. Let X denote the number of heads on the first two coins and Y de the number of heads on the last two : Find (i) $E(Y|X = 1)$ and (ii) Correlation coeffic between X and Y.

30 (a) State and establish Renovsky formula.

(b) Explain important properties and applications of normal distribution.

31 (a) State Bienayme-Chebychev's inequality.

(b) State and prove Lindberg-Levy form of CLJ.

$(2 \times 4 = 8$ weight