E 4250 (Pages : 4) Reg. No.....

Name.....

# B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, OCTOBER 2012

## Third Semester

## PROBABILITY DISTRIBUTIONS

[Complementary Course to Maths, Physics and Computer Applications (Three Main)]

Time : Three Hours Maximum Weight : 25

*Candidate can use ordinary calculator.*

### Part A

*Answer* **all** *questions.*
*Each bunch of* **four** *questions carries a weight of* 1.

BUNCH 1

1. The distribution which associates to number of failures before the first success :
   (a) Binomial. (b) Geometric.
   (c) Poisson. (d) Exponential.
2. The mean and variance of Binomial distribution can be :
   (a) 5 ; 5. (b) 3 ; 5.
   (c) 10 ; 3. (d) None of these.
3. The third central-moment of Poisson ($\lambda$) is :
   (a) $\lambda$. (b) $\lambda-1$.
   (c) $\lambda(\lambda - 1)$. (d) $\lambda^3$.
4. The variance of Uniform distribution taking '$n$' values is 14 (assume values are from 1 to $n$) Then $n$ is :
   (a) 13. (b) 12.
   (c) 14. (d) 10.

BUNCH 2

5. The sum of two independent exponential distributions with parameter value 1 is :
   (a) Exponential. (b) Gamma.
   (c) Normal. (d) Beta.
6. The mean deviation about mean of X : U [0 1] is :
   (a) $\frac{1}{2}$. (b) $\frac{1}{3}$.
   (c) $\frac{1}{4}$. (d) 1.

Turn over

7. The distribution function F $(x)$ of N (0, 1) satisfies :

(a) $F(x) = -F(x)$. (b) $F(x) = -F(-x)$.

(c) $F(x) = 1 - F(-x)$. (d) $F(x) > 1$.

8. If X ~ exp (2), then P $(X > 5 / X > 3)$ is :

(a) $\frac{P(X>3)}{P(X>5)}$ (b) $P(X > 2)$.

(c) $P(X > 5)$. (d) $P(X > 3)$.

BUNCH 3

9. Chebycheff's inequality can be applied to a random variable X if :

(a) $E(X) < \infty$.

(b) $E(X^2) < \infty$.

(c) E (X) is bounded by two fixed reals.

(d) None of these.

10. If X is a random variable E (X) = 5 ; Var (X) = 2 then $P[|X - 5| > 3] \leq$ :

(a) $\frac{7}{9}$. (b) $\frac{2}{9}$.

(c) $\frac{1}{9}$. (d) None.

11. Bernoulli's Law of Large Numbers is associated to :

(a) Converges in probability. (b) Converges in mean.

(c) Converges in variance. (d) All the above.

12. Any distribution with finite variance can be approximated to a normal distribution by :

(a) Central limit theorem. (b) Weak law of large numbers.

(c) Normal law. (d) None of these.

BUNCH 4

13. The degree of freedom associated to $x_1 + 2x_2 + 3x_3 = 50$ where $x_1, x_2, x_3$ are random samples taken from integer population is :

(a) 3. (b) 2.

(c) 1. (d) 4.

14. The square of standard normal distribution is :

(a) Chi-square distribution. (b) $t$-distribution.

(c) F-Distribution. (d) Cauchy distribution.

15. Let X and Y be independent $\chi^2$ variates with degrees of freedom 2 and 3 respectively. The distribution of $\frac{3X}{2Y}$ is :

(a) $F_{2,3}$.

(b) $F_{3,2}$.

(c) $\chi^2_3$.

(d) $\chi^2_2$

16. Let $X_1, X_2, \ldots, X_n$ be a random sample of size $n$ taken from N $(0, \sigma^2)$ and define $t = \frac{\sum_{i=1}^{n} X_i^2}{n}$.

The variance of $t$ is :

(a) $\frac{2\sigma^4}{n}$.

(b) $\frac{2\sigma^4}{n^2}$.

(c) $2\sigma^4$.

(d) None of these.

$(4 \times 1 = 4)$

## Part B

*Answer* **five** *questions.*
*Each question carries* 1 *weight.*

17. State the additive property for three Poisson variates.

18. If X : B $(n, p)$, find cov $\left[\frac{X}{n}, \frac{n-X}{n}\right]$.

19. State any *four* properties of Normal distribution.

20. State Weak Law of Large Numbers.

21. Give *two* examples of distributions which hold lack of memory property.

22. Define sampling distributions with an example.

23. Define statistic with *two* examples.

24. Derive the pdf of standard normal from the pdf of normal.

$(5 \times 1 = 5)$

## Part C

*Answer* **four** *questions.*
*Each question carries a weight of* 2.

25. Derive the mean and variance of B($n$, $p$) from its mgf.
26. Show that beta distribution of first can be obtained from second kind using some transformation.
27. State Lindeberg form of Central limit theorem and substantiate this concept with an example.
28. State the interrelation among Normal, Chi-square, $t$ and F distributions.
29. State Chebycheff's inequality and mention its merit and demerit.
30. Give a rough shape of Binomial, Poisson, Exponential and Uniform continuous distributions.

(4 × 2 = 8)

## Part D

*Answer* **two** *questions.*
*Each question carries a weight of* 4.

31. Derive the recurrence relation for central moments of N ($\mu$, $\sigma^2$) and hence find measure of skewness and kurtosis.
32. State and prove Bernoulli's Law of Large Numbers.
33. Obtain the distribution of $\frac{ns^2}{\sigma^2}$, if samples are taken from N ($\mu$, $\sigma^2$) with $s^2$, the sample variance.

    Also sketch the derived distribution for $n$ = 2, 3, 4.

(2 × 4 = 8)