E 805 (Pages : 4) Reg. No.....

Name.....

B.Sc. DEGREE (CBCSS) EXAMINATION, NOVEMBER 2010

Third Semester

PROBABILITY DISTRIBUTIONS

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

Time : Three Hours Maximum Weight : 25

Candidates can use ordinary calculator.

Part A

Answer **all** *questions.*

Each bunch of 4 *questions carries a weight of* 1.

Bunch 1

1. The mean and variance of binomial distribution are 4 and 3. Then the values of the parameters n and p are :

   (a) 16 and ¼. (b) 5 and ¼.

   (c) 16 and ¾. (d) 5 and ¾.

2. The distribution for which mean = variance is :

   (a) Binomial. (b) Poisson.

   (c) Normal. (d) Uniform.

3. All the cumulants of which distribution are equal :

   (a) Geometric. (b) Poisson.

   (c) Binomial. (d) Uniform.

4. A distribution which possess memory less property is :

   (a) Poisson. (b) Uniform.

   (c) Gamma. (d) Geometric.

Bunch 2

5. If X has a uniform distribution in [0, 1] then the distribution of $-2 \log X$ is :

   (a) Uniform. (b) Chi square.

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

6. The area under the standard normal curve beyond the lines $Z = \pm 2.58$ is :

   (a) 95 %. (b) 99 %.

   (c) 1 %. (d) 10 %.

Turn over

7. For large values of parameter λ, gamma distribution tends to :

   (a) Normal. (b) Beta.

   (c) Exponential. (d) Chi square.

8. If X and Y are independent gamma variates with parameters m and n respectively, then $Z = \frac{X}{Y}$ follows :

   (a) $\beta_1 (m, n)$. (b) $\beta_1 (n, m)$.

   (c) $\beta_2 (m, n)$. (d) $\beta_2 (n, m)$.

Bunch 3

9. In Lindberg-Levy form of central limit theorem, the sum of the rvs asymptotically follows :

   (a) Normal distribution. (b) Binomial distribution.

   (c) Beta distribution. (d) Gamma distribution.

10. If X is a random variable with $E(X) = 3$ and $V(X) = 2$ and if $P\{|X - 3| < h\} \geq 0.99$, then the value of h is :

    (a) 14.14. (b) 1.414.

    (c) $\frac{1}{14.14}$. (d) $\frac{1}{1.414}$.

11. Bernoulli's law of large numbers is related to :

    (a) Frequency approach of probability.

    (b) Axiomatic approach of probability.

    (c) Classical approach of probability.

    (d) All the above.

12. Which of the following is not a statistic :

    (a) Population mean. (b) Sample mean.

    (c) Sample variance. (d) Sample moments.

Bunch 4

13. A relation between mean and variance of Chi square distribution is :

    (a) Mean = Variance. (b) Variance = 2 mean.

    (c) Mean = 2 variance. (d) None of these.

14. If X is distributed as N (0, 1), then X^2 is distributed as :

    (a) Chi square. (b) Normal.

    (c) t. (d) F.

15. The ratio of a standard normal variate to the square root of an independent Chi square variate divided by its degrees of freedom is :

(a) F Statistic. (b) Chi square.

(c) Student's t. (d) None of these.

16. If X follows F (n_1, n_2) distribution, then $\frac{1}{X}$ follows :

(a) F (n_1, n_2). (b) F (n_2, n_1).

(c) Normal. (d) Chi square.

$(4 \times 1 = 4$ weight)

Part B (Short answer questions)

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

17. Define geometric distribution. Give an example.
18. If the probability of hitting a target is 10 % and 10 shots are fired independently ; what is the probability that the target will be hit at least once.
19. Find the moment generating function of uniform distribution in $[a, b]$.
20. If X is a normal variate with mean 30 and standard deviation 5, find $p\ (26 \leq X \leq 40)$.
21. Two unbiased dice are thrown. If X is the sum of the numbers showing up, prove that $P\{|X-7| \geq 3\} \leq \frac{35}{54}$.
22. Explain Lindberg-Levy form of central limit theorem.
23. Define Statistic and Sampling distribution. Give examples.
24. Define t statistic. Give an example of t statistic.

$(5 \times 1 = 5$ weight)

Part C

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

25. Derive Poisson distribution as a limiting form of binomial.
26. Define lack of memory property. Show that exponential distribution satisfies this property.
27. Find mean, median and mode of normal distribution.
28. Define beta distribution of second kind. Derive its relation with beta distribution of the first kind.
29. State and prove Bernoulli's weak law of large numbers.
30. Define F statistics. Write down the pdf of this statistic. Give an example of F statistic. What is the relationship between F and χ^2.

$(4 \times 2 = 8$ weight)

Part D

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

31. Derive the recurrence relation for central moments of binomial distribution. Also find the central moments from this relation.

32. State and prove Tchebycheff's inequality. Let X_i assume the values i and $-i$ with equal probabilities. Show that the law of large numbers cannot be applied to the independent variables $X_1, X_2, \ldots$.

33. Let $X_1, X_2 \ldots, X_n$ be a random sample from a population with mean μ and variance σ^2. Find

    (i) The distribution of $\overline{X}$.

    (ii) Prove that $\frac{ns^2}{\sigma^2}$ is a Chi square variate with $(n-1)$ degrees of freedom.

    (iii) Prove that $\overline{X}$ and $\frac{ns^2}{\sigma^2}$ are independently distributed.

$(2 \times 4 = 8$ weight$)$