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D – 3115

Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, December 2017
First Degree Programme Under CBCSS
Complementary Course for Mathematics
ST 1331.1 – PROBABILITY DISTRIBUTION AND THEORY OF ESTIMATION
(2014 Admn. Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions, **each** carrying **1** mark.

1. Determine the mode of a binomial distribution for which the mean is 6 and variance 2.
2. Obtain the mean of uniform distribution.
3. Obtain the moment generating function (m.g.f.) of Poisson distribution.
4. State reproductive property of Poisson distribution.
5. Define Geometric distribution.
6. State Chebychev's inequality.
7. Define normal distribution.
8. Define the term parameter.
9. Give an example of a statistic which is unbiased.
10. What is meant by likelihood function of the sample ? **(1×10=10 Marks)**

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SECTION – B

Answer **any 8** questions, each carrying **2** marks.

11. Define exponential distribution. Obtain the m.g.f. of Exponential distribution.
12. Define Beta distribution of first kind. And also obtain its moments.
13. The p.d.f. of a r. v. 'x' is given by $f(x) = \frac{m^{k+1}}{k!} e^{-mx} x^k$, {x > 0, m > 0 and k is a non negative integer. Find the moment generating function.

P.T

14. Write any four properties of normal distribution.
15. State weak law of large numbers.
16. Write down the characteristics of t-distribution (any three).
17. State Neyman's condition for sufficiency.
18. X is a r. v. with mean 5 and variance 3. Find the lower bound to, $P\{|X-5|<3\}$.
19. Find a lower limit for the variance of any unbiased estimator of θ, where $f(x, \theta) = \theta e^{-\theta x}$, $x > 0$.
20. Find the M.L.E. of λ based on a sample taken from the population with p.d.f. $f(x) = \frac{e^{-\lambda}\lambda^x}{x!}$, $x = 0, 1, 2 \ldots$.
21. S.T. the square of t variate with n d.f. is F(1, n).
22. S.T. the sample variance is a consistent estimator of the population variance in the case of normal population $N(\mu, \sigma)$.

(8×2=16 Ma

SECTION – C

Answer **any 6** questions, **each** carrying **4** marks.

23. Derive Renovsky formula of Binomial distribution.
24. For a normally distributed population 7% of the items have their values less than 35 and 89% have their values less than 63. Find the mean and S.D. of the distribution.
25. Obtain the distribution of the sum of squares of n independent r.v.'s following N(0,1).
26. S.T. for a Poisson distribution with unit mean the mean deviation about the mean is $\frac{2}{e}$ times the standard deviation.
27. If the r.v. 'x' has p.d.f., $f(x) = (\beta+1)\, x^{\beta}$, $0 \le x \le 1$, $p > 0$. Obtain the m.l. e. of β.
28. The mean of a sample of size 20 from a normal population $N(\mu, 8)$ was found to be 81.2. Find a 90% confidence interval for μ.
29. If X_1 and X_2 are independent X^2 r.v.s each with one degrees of freedom. Find λ such that $P[x_1 + x_2 > \lambda] = \frac{1}{2}$.

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30. A die is thrown eight times. Occurrence of 5 or 6 is considered a success. Find the mean number of successes and its standard deviation.

31. X_1, X_2, X_3 are three independent observations from a population with mean μ and variance σ^2, if $t_1 = x_1 + x_2 - x_3$ and $t_2 = 2x_1 + 3x_2 - 4x_3$ are two estimates of μ, compare their efficiencies. **(6×4=24 Marks)**

SECTION – D

Answer **any 2** questions, **each** carries **15** marks.

32. X and Y are independent binomial variates with parameters m_1, m_2. Find
    1) The distribution of (X+Y)
    2) The conditional distribution of X given X + Y.

33. Fit an appropriate normal curve to the following data and calculate the theoretical frequencies.

Class	12 – 15	16 – 19	20 – 23	24 – 27	28 – 31	32 – 35	36 – 39
f	5	10	22	25	20	12	6

34. a) Explain convergence in probability.

    b) If X_i is a r. v. which assumes values i and – i with equal probabilities, s.t. the law of large numbers cannot be applied to the sequence X_1, X_2 .....

35. a) Define consistency of an estimator. State set of sufficient conditions for the consistency of an estimate.

    b) S.T. $t_n = \frac{n\bar{x}}{n+1}$ is a consistent estimate of λ, where $\bar{x}$ is the mean of samples of size n taken from a Poisson population. **(2×15=30 Mark**

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