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S – 3408

Reg. No. : ....

Name : ....

Third Semester B.Sc. Degree Examination, February 2024

First Degree Programme under CBCSS

Statistics

Complementary Course for Mathematics

ST 1331.1 : STATISTICAL DISTRIBUTIONS

(2018 – 2021 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** question. **Each** question carries **1** mark.

1. Define Poisson distribution.
2. Find the mean of binomial distribution.
3. Give a descrete distribution with mean and variance are equal.
4. Give a continuous distribution which posess lack of memory property.
5. Define parameter.
6. Write down the probability mass function of hyper geometric distribution.
7. Define standard normal distribution.
8. Find the mean of exponential distribution.

9. Define Chi-square statistic.

10. Give the probability density function of beta distribution of first kind.

($10 \times 1 = 10$ Marks)

SECTION – B

Answer any **eight** questions. **Each** question carries **2** marks.

11. Find the moment generating function of binomial distribution.

12. Find the variance of geometric distribution.

13. If X follows descrete uniform distribution with $f(x) = \frac{1}{k}, x = 1,2...k$. Find variance of X.

14. Let X follows binomial distribution (5, P) such that $P(x=2) = P(x=3)$. Find the value of P.

15. Describe beta distribution of second kind.

16. Discuss Bernoulli's law of large numbers.

17. Discuss any two applications of central limit theorem.

18. Describe F- distribution and mention one of its applications.

19. Describe convergence in probability.

20. Find the mean of hyper geometric distribution.

21. If X is a Poisson variable such that $P(x=2) = 3P(x=4)$. Find the mean of X.

22. A Poisson distribution has double mode at $x=1$ and at $x=2$. What is the probability that x will have one or the other of these two values?

($8 \times 2 = 16$ Marks)

SECTION – C

Answer any **six** questions. **Each** question carries **4** marks.

23. Obtain the mode of binomial distribution.

24. State and prove the additive property of Poisson distribution.

25. Obtain the characteristics function of gamma distribution and hence find its variance.

26. Find the mean deviation about mean of normal distribution.

27. For a geometric distribution with probability function $P(x = x) = \left(\frac{1}{2}\right)^x, x = 1,2\ldots$ prove that Chebechev's inequality gives $P\{|x-2| \leq 2\} > \frac{1}{2}$, while the actual probability is $\frac{15}{16}$.

28. State and prove the additive property of gamma distribution.

29. Obtain the moment generating function of Chi-square distribution and hence find its mean and variance.

30. State the relationship between $t \infty F$ statistics.

    If $P\{F(10,12) > 2.753\} = 0.05 = P\{F(1,12) > 4.747\}$ find $P\{F(12,10) > 2.753\}$ and $P\{-\sqrt{4.747}\} < t_{12} < \sqrt{4.747}$.

31. If X and Y are independent gamma variates with parameters λ and μ respectively, obtain the distribution of $\frac{X}{X+Y}$.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. **Each** question carries **15** marks.

32. (a) Obtain the recurrence relation of probabilities of Poisson distribution.

(b) Fit a Poisson distribution. for the following data.

x:	0	1	2	3	4	5	6	7	8
f(x):	56	156	132	92	37	22	4	0	1

33. (a) Obtain the moment generating function of $N(\mu, \sigma^2)$.

(b) Find the recurrence relation of central moments of $N(\mu, \sigma^2)$. Also show that all odd order moments are zero.

34. (a) Derive the distribution of mean of a sample taken from a normal population $N(\mu, \sigma^2)$.

(b) If X_1, X_2, X_3 and X_4 are independent observations from a univariate normal population with mean zero and unit variance, state giving reasons the sampling distribution of the following.

(i) $u = \dfrac{\sqrt{2}\, X_3}{\sqrt{X_1^2 + X_2^2}}$ (ii) $V = \dfrac{3X_4^2}{X_1^2 + X_2^2 + X_3^2}$.

35. State and prove Chebychev's inequality using Chebychev's inequality determine how many times a fair coin must be tossed inorder that the probability will be atleast 0.90 that the ratio of observed number of heads to the number of tosses will lie between 0.4 and 0.6

(2 × 15 = 30 Marks)