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Reg. No. : ....

Name : ....

Third Semester B.Sc. Degree Examination, January 2023

First Degree Programme Under CBCSS

Statistics

Complementary Course for Mathematics

ST 1331.1 : STATISTICAL DISTRIBUTIONS

(2018 Admission)

Time : 3 Hours Max. Marks : 80

Use of statistical table and scientific calculator are permitted.

SECTION – A

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

1. Find $P(X > 8)$, if X follow discrete uniform distribution over the numbers 1, 2, ..., 10.

2. Obtain the mean of the binomial random variable with m.g.f. $(0.3 + 0.7e^t)^5$.

3. Find the mean of Poisson random variable with double modes at $x = 4$ and $x = 5$.

4. Write down the m.g.f. of X where $X \sim N(0, 2)$.

5. State the probability distribution followed by the sum of two independent exponential random variable with common parameter.

6. Define rectangular distribution.

P.T.O.

7. Define Type I beta distribution.

8. What do you mean by standard error?

9. If t follow t-distribution with n degrees of freedom, What is the distribution of t^2?

10. Define parameter.

(10 × 1 = 10 Marks)

SECTION – B

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

11. X is a Poisson random variable with variance 4, obtain $P(X = 0)$.

12. For a random variable X following geometric distribution, prove that $f(x+1) = q\,f(x)$.

13. The ratio of probabilities of 3 successes and 2 successes in five independent Bernoullian trials is $\frac{1}{3}$. Find the probability of success.

14. Find the m.g.f. of a random variable following exponential distribution.

15. If $X \sim N(8,2)$, find $P(X > 8)$.

16. What is the value of θ for which the mean and variance of a uniform distribution over $(0,\theta)$ are equal?

17. Define convergence in probability.

18. State central limit theorem.

19. If $X \sim \chi^2_{(n)}$, find the mode of X.

20. A random sample of size 15 is taken from $N(\mu, 2^2)$. What is the probability that the sample mean will differ from the population mean by more than 1.5?

21. State weak law of large numbers.

22. Prove that the odd order moments of a normal distribution are zero.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Derive the mode of binomial distribution.

24. If X is a Poisson random variable such that $P(X = 2) = 9P(X = 4) + 90P(X = 6)$, find (a) λ and (b) the coefficient of skewness.

25. State and prove the lack of memory property of geometric distribution.

26. If X is a normal variate with mean 50 and standard deviation 10, find $P(Y \leq 3137)$, where $Y = X^2 + 1$.

27. Derive the moment generating function of normal distribution.

28. Derive the mean and variance of beta distribution of first kind.

29. A symmetric die is thrown 600 times. Find the lower bound for the probability of getting 80 to 120 sixes.

30. State and prove Bernoulli's weak law of large numbers.

31. State and prove the reproductive property of chi-square distribution.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Derive Poisson distribution as a limiting case of binomial distribution.

33. In a photographic process, the development time of prints may be looked upon as a random variable having the normal distribution with a mean of 16.28 seconds and a standard deviation of 0.12 second. Find the probability that it will take

(a) Any where from 16.00 to 16.50 seconds to develop one of the prints

(b) At least 16.20 seconds to develop one of the prints

(c) At most 16.35 seconds to develop one of the prints

(d) For which value is the probability 0.95 that it will be exceeded by the time it takes to develop one of the prints?

34. Fit a normal distribution to the following data and find the theoretical frequencies.

Class	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100
Frequency	3	21	150	335	326	135	26	4

35. State and prove Chebychev's inequality.

(2 × 15 = 30 Marks)