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D4BEM2205 (PAGES 2) Reg.No:..................

Name:....................

FOURTH SEMESTER B. Sc. DEGREE EXAMINATION, APRIL 2024

(Regular/Improvement/Supplementary)

ECONOMICS AND MATHEMATICS

GDMT4B05T: DISTRIBUTION THEORY

Time: 2 $\frac{1}{2}$ Hours **Maximum Marks: 80**

Section A: Answer the following questions. Each carries *two* marks. (Ceiling 25 Marks).

1. Distinguish between discrete and continuous random variables.
2. Define probability mass function.
3. Prove that $M_{aX+b}(t) = e^{bt}M_X(at)$.
4. What do you mean by bivariate random variable?
5. Define joint pdf of two continuous random variables X and Y.
6. Give any two real life situations where Poisson law can be applied.
7. Comment on the statement "The mean of a binomial distribution is 3 and variance is 4".
8. Define negative binomial distribution.
9. Dcfinc standard normal distribution.
10. Obtain the mean of uniform distribution.
11. Obtain the mgf of Exponential distribution.
12. Define Cauchy distribution.
13. State Chebychev's inequality.
14. State central limit theorem.
15. Define the term convergence in probability.

(PTO)

SECTION B: Answer the following questions. Each carries *five* marks. (Ceiling 35 Marks)

16. A random variable X has mean 10 and variance 25. Find for what values of a and b does the variable $Y = aX + b$ has expectation zero and variance unity.

17. If X is a random variable having the pdf $f(x) = \frac{x+1}{2}$, $-1 \leq x \leq 1$ find $E(X)$.

18. Derive the mean and variance of geometric distribution.

19. Obtain the mgf of binomial distribution and establish its additive property.

20. Obtain the mean of normal distribution.

21. Define gamma distribution and find its mgf.

22. Define χ^2-statistic and obtain its variance.

23. Prove that the square of t variate with n degrees of freedom is $F(1, n)$.

SECTION C: Answer any two questions. Each carries *ten* marks.

24. If X is a random variable having the pdf $f(x) = q^{x-1}p$, $x = 1, 2, ...,$ $p + q = 1$ find the mgf and hence find its mean and variance.

25. Let X be a binomial random variable with mean 2 and variance $\frac{4}{3}$. Find $P(X = 0)$ and $E(X - 2)^3$.

26. Define normal distribution. Find its variance.

27. i) Define the terms (1) parameter (2) statistic (3) sampling distribution

    ii) Let X be $N(100, 10^2)$ distributed. Find the sample size n so as to have $P(\bar{x} \geq 101.645) = 0.05$.

(2 x 10 = 20 Marks)