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D4BEM2305 **Reg. No.............................**

Name: ....

FOURTH SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2025

(Regular/Improvement/Supplementary)

ECONOMICS & MATHEMATICS (DOUBLE MAIN)

GDMT4B05T: DISTRIBUTION THEORY

Time: 2 ½ Hours **Maximum: 80 Marks**

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

1. The joint p.m.f of a discrete bivariate random variable is given below. Find the value of C.

Y \ X	1	2	3
1	C	C	2C
2	2C	3C	C

2. A discrete random variable has the following p.m.f. Find E(X).

x	0	1	2	3
P(x)	0.1	0.3	0.4	0.2

3. Let X be a random variable with p.d.f $f(x)=\begin{cases}\frac{1}{2}, -1<x<1\\ 0,\ otherwise\end{cases}$

   Obtain the first raw moment μ_1'.
4. Write down the formula for calculating correlation between two variables.
5. Define Pareto distribution.
6. A discrete random variable X follows a uniform distribution taking values 1,2,3,4,5. Find mean and variance.

(PTO)

7. Write down the probability generating function of a Poisson distribution.
8. Define parameter.
9. Find the m.g.f of a Poisson variate with mean value 7.
10. Write down the p.d.f of a continuous distribution which possess lack of memory property.
11. Let $X \sim \exp(\theta)$ Write down it's mean , variance and m.g.f.
12. State lack of memory property of exponential distribution.
13. Write down the m.g.f of a one parameter gamma distribution.
14. State Chebyshev's inequality.
15. Define convergence in probability.

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

16. If the joint probability function of a continuous bivariate random variable is:
    f (x, y) = x + y ; 0 < x < 2, 0 < y < 1.
    Find the marginal distribution of Y. Also obtain E(Y).
17. Let X be a continuous random variable with p.d.f. $f(x) = \frac{1}{8}(1 + x) \quad ; \quad 2 < x < 4$.
    Find the mean and variance.
18. If X follows a Poisson distribution such that P(X=2) = 9P(X=6). Find the mean and variance of X.
19. What do you mean by statistic? Give examples. Also explain sampling distribution of statistic.
20. Let a random variable X follows a two-parameter gamma distribution with parameters m=1 and p=2. Obtain mean, variance and m.g.f.
21. If X is normally distributed with mean 11 and SD 1.5. Find the number k such that
    (i) P(X > k) = 0.3 and (ii) P(X < k) = 0.09
22. What are the three major sampling distributions? Write down their p.d.f's. Explain the relation between them.
23. The number of printing mistakes per page in a book follows a Poisson distribution with parameter 2.5. Find the probability that (i) There is no printing mistake in a particular page; (ii) There are exactly 3 printing mistakes in a particular page.

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

24. The p.m.f of a random variable is given below.

X = x	- 2	- 1	0	3
P(X = x)	C	1/4	1/4	1/4

(i) Find the value of C

(ii) Find the probability distribution of X^2

(iii) Find P(X>2)

(iv) Find P(1<X<2)

25. For a binomial distribution mean = 7 and variance = 2.1 Find:

(i) Moment generating function

(ii) P(x=5)

(iii) P(X>5)

(iv) Probability generating function

26. What do you mean by rectangular distribution? Write down it's p.d.f , mean, variance and m.g.f. If X follows a rectangular distribution U(-2,2) find: (i) P(-1<X<1) (ii) P(X>1.5) (iii) P(-1<X<0) (iv) P(X>0).

27. A random variable X takes the values – 1, 1, 3 and 5 with probabilities $\frac{1}{6}, \frac{1}{6}, \frac{1}{6}, \frac{1}{2}$ respectively. Using Chebyshev's inequality, determine $P[|X-3|\geq 3]$.

(2 x 10 = 20 Marks)