Name **24U346**

Reg. No .....

B.Sc. DEGREE END SEMESTER EXAMINATION - OCTOBER 2024

SEMESTER 3 : STATISTICS (FOR MATHEMATICS AND COMPUTER APPLICATION)

COURSE : **19U3CPSTA03 / 19U3CRCST03 : PROBABILITY DISTRIBUTIONS**

(For Regular 2023 Admission and Improvement/Supplementary 2022/2021/2020/2019 Admissions)

Time : Three Hours Max. Marks: 75

(Use of Scientific Calculator and Statistical tables are permitted)

PART A

(Each question carries 1 mark. Maximum marks from this part is 10)

1. What is moment generating function?
2. State multiplication theorem on expectation?
3. If x is N (5, 3) find the distribution of Y=2X+5.
4. Check whether the difference of two independent Poisson variables with same parameter follows Poisson distribution
5. Give the expression for the even ordered central moment of a normal distribution.
6. State the recurrence relation for central moments of the Poisson distribution?
7. Define harmonic mean in terms of expectation of a random variable.
8. Define F statistic.
9. State Tchebycheff's inequality
10. If X is a random variable with E(X) =3, V(x) =2, then find k if P[/X-3/<2] ≥ k
11. Define Chi-square distribution?
12. If $X_1, X_2, \ldots X_{16}$ is a random sample from a normal distribution with mean 10 and s.d. 4, Obtain the distribution of $(\Sigma X_i)/16$ for i=1,2,3,….16.

PART B

(Each question carries 3 marks. Maximum marks from this part is 15)

13. 2% of hooks manufactured by a firm are found to be defective. Find the probability that a box containing 100 hooks have
    (i) exactly 4 defectives
    (ii) More than one defective
14. Show that the square of t distribution is an F distribution from the definition of t?
15. A man tosses a fair coin 10 times . find the probability that he will have heads on tosses 1,3,5,7,9 and tails on 2,4,6,8,10 tosses?
16. Write any three limitations of mgf.
17. If X follows normal distribution with mean 10 and s.d. 4 and Y follows normal with mean 6 and s.d. 3, find P[(X-Y)<20] .Given that X and Y are independent.
18. What are the adivantages and disadvantages of Tchebycheff's inequality?
19. Find the moment generating function of the random variable X having the p.d.f. $f(x) = \begin{cases} 1/3 & \text{when } 0 < x < 3 \\ 0 & otherwise \end{cases}$

PART C

(Each question carries 5 marks. Maximum marks from this part is 20)

20. State 'Lack of memory property'. Show that exponential distribution possess the lack of memory property
21. Explain the importance of normal distribution in Statistics?
22. Explain the different methods of selecting a simple random sample from a population.
23. Random variable X has the p.d.f. given by $f(x) = 2e^{-2x}$, $x>0$ and $= 0$ if $x \leq 0$. Find the M.G.F. Also find the first four moments about the origin?
24. Obtain the mode of Binomial distribution with parameter n and p.
25. State and prove Bernoulli's Law of large numbers.

PART D

(Each question carries 10 marks. Maximum marks from this part is 30)

26. (a) Define binomial distribution? Find its mean and standard deviation?
(b) The probability of the birth of a male child is ½ , 4096 families were chosen at random having just four children (1) find out the probabilities of having 0,1,2,3,4 male children in a family and ascertain the theoretical frequency distribution based on these probabilities. Find the mean and standard deviation of this distribution, and (2) if the probability of the birth of a male child is ¼, what will be the probabilities having 0,1,2,3,4 male children in a family?
27. If $f(x,y) = x+y$ for $0<x, y<1$ and equal to zero elsewhere is the joint p.d.f. of (x,y) , find the correlation coefficient of x and y?
28. i) Define sampling distribution. Obtain the sampling distribution of the sample mean taken from a normal distribution. ii) Obtain the sampling distribution of the square of a standard normal variable.
29. State and prove Tchebycheff's inequality? What are the advantages and disadvantages of this inequality?