K24U 3452

Reg. No. : .....

Name : .....

III Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/ Improvement) Examination, November 2024
(2019 to 2023 Admissions)
COMPLEMENTARY ELECTIVE COURSE IN STATISTICS FOR MATHEMATICS/COMPUTER SCIENCE
3C03STA : Probability Distributions

Time : 3 Hours Max. Marks : 40

PART – A

Short Answer (Answer **all** questions. **1** mark **each**.)

1. State multiplication theorem on expectation.
2. The first three raw moments of random variable X are –1.5, 17 and –30. Calculate the third central moment of X.
3. Write down the probability mass function of a random variable having uniform distribution over 4 points.
4. Define Bernoulli distribution.
5. Give the pdf of standard normal distribution.
6. What do you mean by lack of memory property ? **(1×6=6)**

PART – B

Short Essay (Answer **any 6** questions. **2** marks **each**.)

7. Discuss the properties of mathematical expectation.
8. Give an example of a random variable for which expectation does not exist.
9. For a random variable X having binomial distribution, the mean and variance are 24 and 16 respectively. Obtain its moment generating function.

P.T.O.

10. Find the variance of a random variable having pmf $f(x) = \left(\frac{1}{2}\right)^x$, x = 1, 2, 3, ...

11. Obtain the moment generating function of exponential distribution.

12. Define beta distribution of second kind and obtain its mean.

13. Distinguish between parameter and statistic with suitable examples.

14. A random sample of size 25 is taken from a normal distribution with mean 50, standard deviation 4. Find the probability that sample mean lie between 48 and 52. **(2×6=12)**

PART – C

Essay (Answer **any 4** questions. **3** marks **each**.)

15. The joint pmf of a bivariate random variable (X, Y) is

x \ y	– 1	0	1
– 1	0	0.1	0.1
0	0.2	0.2	0.2
1	0	0.1	0.1

Find V(X|Y = 0).

16. State and prove the additive property of binomial distribution.

17. If X and Y are independent random variables having same geometric distribution, find the conditional distribution of X, given X + Y = 3.

18. Find the harmonic mean of a random variable having beta distribution of first kind.

19. Obtain the mgf of a random variable having pdf

$$f(x) = \frac{1}{\Gamma\alpha\beta^{\alpha}} x^{\alpha-1} \exp\left(-\frac{x}{\beta}\right), x > 0, \alpha, \beta > 0.$$

20. Obtain the mean and standard deviation of a chi-square random variable with n degrees of freedom. **(3×4=12)**

PART – D

Long Essay (Answer **any 2** questions. **5** marks **each**.)

21. A bivariate random variable (X, Y) has joint pdf $f(x, y) = x + y$, $0 < x, y < 1$. Find the correlation between X and Y.

22. For the Poisson distribution with parameter λ, derive the recurrence relation $\mu_{r+1} = \lambda\left[\frac{d\mu r}{d\lambda} + r\mu_{r-1}\right]$ and hence deduce the first four central moments.

23. Obtain the characteristic function of normal distribution.

24. Define chi-square statistic, Student's t statistic and F statistic. Derive the inter relations between them. **(5×2=10)**