LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

SECOND SEMESTER – **APRIL 2023**

17UST2MC01 – CONTINUOUS DISTRIBUTIONS

Date: 10-05-2023   Dept. No.   Max. : 100 Marks
Time: 09:00 AM - 12:00 NOON

SECTION – A

Answer ALL the questions   **(10 X 2 = 20)**

1. Define Joint probability mass function of two random variables.

2. Let X be a continuous random variable with p.d.f given by $f(x) = \begin{cases} kx & 0 \le x < 1 \\ k & 1 \le x < 2 \\ -kx + 3k & 2 \le x < 3 \\ 0 & elsewhere \end{cases}$.

   Find the value of k.

3. Prove that addition of two independent normal variates is also a normal variate.
4. If X is uniformly distributed with mean 1 and variance 4/3, then find P(X<0).
5. Write the differences between one dimensional and two dimensional random variables.
6. Write down any two properties of gamma distribution.
7. What is meant by F-distribution?
8. State any two applications of t-distribution.
9. Write the mean and variance of chi-square distribution.
10. Define order statistics.

SECTION – B

Answer any FIVE questions   **(5 X 8 = 40)**

11. Two random variables X and Y have the following joint probability density function:
    $f(x, y) = \begin{cases} k(8 - 2x - 3y); & 0 \le x \le 1 \; ; 0 \le y \le 1 \\ 0 & ; \quad elsewhere \end{cases}$.

    Compute (i) the constant k,
    (ii) Marginal density functions of X and Y,
    (iii) Conditional density functions of X given Y=y and Y given X=x.   (2+3+3)

12. Derive the p.d.f of F-distribution.
13. Derive the mgf of normal distribution and hence find its mean and variance.
14. In an intelligence test administered to 10000 children, the average score is 42 and standard deviation is 24. Calculate (i) The number of children exceeding the score 60, and (ii) The number of children with score lying between 20 and 40.   (4+4)
15. Write down the properties of normal distribution.
16. Prove that exponential distribution has a lack of memory property.
17. Derive the joint p.d.f of first and second order statistics.
18. Derive m.g.f of chi-square distribution and hence find its mean and variance.
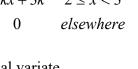
SECTION – C

Answer any TWO questions   **(2 X 20 = 40)**

19. Prove that the limiting form of binomial distribution is normal distribution.
20. If $f(x, y) = 2 \; ; 0 < x < y, \; 0 < y < 1$;
    Find (i) Marginal distributions of X and Y.

(ii) Conditional distributions of X given Y=y and Y given X=x.

(iii) COV(X,Y).

(iv) E(X|Y) and V(X|Y).   (4+4+6+6)

21. State and prove central limit theorem.

22. Derive the moments of t-distribution and hence find its β_1 and β_2 coefficients.

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