22U255S (Pages: 2) Name: ……………………

Reg. No ……………………

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2023

(CUCBCSS-UG)

CC15U ST2 C02 – PROBABILITY DISTRIBUTIONS

(Statistics – Complementary Course)

(2015 to 2018 Admissions – Supplementary/Improvement)

Time: Three Hours Maximum: 80 Marks

Section A (One word Questions**)**

Answer ***all*** questions. Each question carries 1 mark.

Fill up the blanks:

1. If C is a constant $V(C) = \cdots\cdots\cdots$
2. The p.d.f of a standard Cauchy distribution is $\cdots\cdots\cdots$
3. If two variables X and Y are independent, then E (XY) = $\cdots\cdots\cdots$
4. The discrete distribution possessing the memoryless property is $\cdots\cdots\cdots$
5. A family of distribution for which the mean is equal to variance is $\cdots\cdots\cdots$

Write true or false:

6. If X and Y are independent random variables, then $f(x,y) = f_1(x)f_2(y)$.
7. For Poisson distribution mean is always greater than variance.
8. m.g.f. does not exist always.
9. $E(X^2) \geq (E(X))^2$.
10. In a normal distribution M.D = $\frac{4}{5}$ S.D

(10 × 1 **= 10 Marks)**

Section B (One Sentence Questions)

Answer ***all*** questions. Each question carries 2 marks.

11. Define conditional expectation.
12. Define Mathematical expectation.
13. Define characteristic function.
14. Define m.g.f of a random variable.
15. Define Kurtosis.
16. Define uniform distribution of the discrete type.
17. Define Pareto distribution.

(7 × 2 = 14 Marks)

Section C (Paragraph Questions)

Answer any ***three*** questions. Each question carries 4 marks.

18. Obtain the moment generating function of a Poisson distribution.
19. Let $f(x, y) = 2, 0 < x < 1; 0 < y < 1$ .Check whether X and Y independent.
20. If X is a random variable and a and b are constants, then show that $E(aX + b) = aE(X) + b$.
21. In two independent random variables X and Y show that $M_{X+Y}(t) = M_X(t)M_Y(t)$.
22. Define mean of Exponential distribution.

(3 × 4= 12 Marks)

Section D (Short Essay Questions)

Answer any ***four*** questions. Each question carries 6 marks.

23. Prove or disprove that zero correlation implies variables are independent.
24. Prove that for any two r.v.s X and Y, $[E(XY)]^2 \leq E(X^2)E(Y^2)$.
25. State and prove the addition theorem on expectation.
26. State and prove Chebyshev's inequality.
27. Establish the lack of memory property of exponential distribution.
28. Obtain the mean of normal distribution.

(4 × 6 = 24 Marks)

Section E (Essay Questions)

Answer any ***two*** questions. Each question carries 10 marks.

29. Derive the relation between raw and central moments and hence express first four central moments in terms of raw moments.
30. State and prove recurrence relation for central moments for a binomial distribution.
31. If the joint pdf of X and Y, is $f(x, y) = x + y, 0 \leq x \leq 1; 0 \leq y \leq 1$. Find the coefficients of correlation and regression.
32. State and prove Bernoulli's law of large numbers.

(2 × 10 = 20 Marks)

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