19U263S (Pages: 2) Name……….……………

Reg No…………………..

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2020

(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 two variables $X$and Y are independent, then $E(XY) =$ …………...
2. X is a Poisson variable with mean 2. Then $V(X) =$ …………....
3. When $n = 1$, Binomial $B(n, p)$ reduces to …………... distribution
4. If $log_e X$ follows normal distribution then distribution of X is …………...
5. Probability mass function can be defined as $p(x) =$ …………...

Write true or false:

6. If X is a continuous r.v. having Uniform distribution in $[a, b]$, then $E(X) = \frac{b+a}{2}$
7. For Poisson distribution mean is always greater than variance.
8. Moment generating function exists for all distributions.
9. Lack of memory property exists for exponential distribution.
10. Fifth central moment of $N(\mu, \sigma^2)$ is zero.

(10 × 1 = 10 Marks)

Section B (One Sentence questions)

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

11. Define Pareto distribution.
12. Define raw and central moments
13. Define conditional expectation.
14. Define convergence in probability.
15. Find the expectation of the number on a die when thrown.
16. Give any four properties of Normal distribution.
17. Define classical definition of probability.

(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. Define rectangular distribution over (a, b) and obtain its moment generating function
20. If X_1 and X_2 are independent random variables, show that $V(X_1+X_2) = V(X_1-X_2)$
21. Define mean of Exponential distribution.
22. Let $f(x,y) = 2,\ \ 0 < x < 1; 0 < y < 1$. Check whether X and Y are independent.

(3 × 4 = 12 Marks)

Section D (Short Essay questions)

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

23. Derive the variance of a Normal distribution.
24. If X and Y have joint pdf $f(x,y) = 2,\ \ 0 < y < x < 1$. Show that $E(XY) \neq E(X).E(Y)$.
25. A random variable X has a discrete uniform distribution over the integers $1,2,3,\ldots\ldots,n$. Obtain the m.g.f. of X and hence obtain the mean.
26. If X follows exponential distribution $f(x) = \theta e^{-\theta x}, x > 0$, find V(X)
27. Prove or disprove that zero correlation implies variables are independent.
28. Fit a Poisson distribution to the following data:

No. of accidents	0	1	2	3	4	5
No. of men	95	75	44	18	2	1

(4 × 6 = 24 Marks)

Section E (Essay questions)

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

29. State and prove recurrence relation for central moments for a binomial distribution.
30. Derive an expression for mean deviation about mean of normal distribution.
31. (a) State and prove Chebychev's inequality.

    (b) A random variable X has mean 50 and variance 100. Use Chebyshev's inequality to obtain appropriate bounds for $P[|X - 50| \geq 15$.
32. Let the joint probability density function of (X,Y) be:

$$f(x,y) = \begin{cases} 3xy. & 0 \leq x \leq 1; 0 \leq y \leq 1 \\ 0, elsewhere \end{cases}$$

Find (i) $E(Y|X = x)$; and (ii) $E(X|Y = y)$

(2 × 10 = 20 Marks)

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