20U369 (Pages: 2) Name: ………………………

Reg. No: ……………………

THIRD SEMESTER B.Voc. DEGREE EXAMINATION, NOVEMBER 2021

(CUCBCSS – UG)

(Regular/Supplementary/Improvement)

CC18U GEC3 ST08 - PROBABILITY DISTRIBUTIONS

(B.Voc. – Information Technology)

(2018 Admission onwards)

Time: Three Hours Maximum: 80 Marks

Section A (One word questions)

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

Fill in the blanks:

1. If X is a random variable having the pdf $f(x)$, then $E\left(\frac{1}{X}\right)$ is used to find -------
2. Joint cumulative distribution function $F(x, y) =$ -------
3. The discrete distribution possessing the memoryless property is -------
4. The Normal distribution is symmetric about -------
5. If 'c' is a constant, then Var(cx) = -------

Write True or False:

6. If X and Y are independent random variables, then $Cov(X, Y) = 0$.
7. $E(Y/X = x)$ is called regression function of Y on X.
8. The mean of a Binomial distribution is 3 and variance is 4.
9. If $X \rightarrow N(\mu, \sigma^2)$ then the central moments of odd order are unity.
10. Lindeberg Levy Central Limit Theorem assumes that the random variables are independent and identically distributed.

(10 × 1 = 10 Marks)

Section B (One Sentence questions)

Answer any ***eight*** questions. Each question carries 2 marks.

11. Show that $E(aX + b) = aE(X) + b$.
12. Define r^{th} central moment of a random variable.
13. Define Characteristic function.
14. What are the measures of Skewness and Kurtosis in terms of moments?
15. Define bivariate random variable.
16. Define conditional probability density function.
17. Define Covariance.
18. Define Binomial distribution.

19. Define Standard Normal distribution.
20. State Weak Law of Large Numbers.
21. Explain the term 'convergence in probability'.
22. State Central Limit Theorem.

(8 × 2 = 16 Marks)

Section C (Short Essay questions)
Answer any ***six*** questions. Each question carries 4 marks.

23. Derive the relationship between raw moments and central moments.
24. Check whether the random variables X and Y are independent if the joint probability mass function is
$$f(x, y) = \frac{x + 2y}{18}, x = 1,2; y = 1,2.$$
25. Show that $E(XY) = E(X)E(Y)$ if X and Y are independent random variables.
26. State and prove the additive property of Binomial distribution.
27. Derive mean and variance of Uniform distribution on [0,1].
28. Write down the important properties of Normal distribution.
29. Determine the first three moments of a random variable if the moment generating function is $M_{X(t)} = e^{t^2/2}$.
30. Derive mean and variance of Exponential distribution with parameter θ.
31. State and prove lack of memory property of Exponential distribution.

(6 × 4 = 24 Marks)

Section D (Essay questions)
Answer any ***two*** questions. Each question carries 15 marks.

32. The joint pdf of (X, Y) is given by $f(x, y) = 2, 0 < x < y < 1$. Find the conditional mean and variance of X given $Y = y$.
33. Find the correlation coefficient ρ_{XY} if the two random variables X and Y having joint probability mass function
$$f(x, y) = \frac{x + y}{21}, x = 1,2,3;\ y = 1,2.$$
34. Derive the moment generating function of a Normal random variable with mean μ and variance σ^2.
35. State and prove Chebychev's inequality.

(2 × 15 = 30 Marks)

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