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Reg. No. : ....

Name : ....

Second Semester B.Sc. Degree Examination, May 2019

First Degree Programme Under CBCSS

Complementary Course for Mathematics

ST 1231.1 : RANDOM VARIABLES AND ANALYSIS OF BIVARIATE DATA

(2014-17 Admissions)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. Write the necessary and sufficient condition for a function is said to probability mass function.

2. Two random variables are said to be independent if ______________.

3. Define discrete random variables.

4. Let $F(x,y)$ represents the distribution function of (X,Y), then $F(+\infty, +\infty) =$ ______________.

5. If the third central moment is positive then the shape of the frequency curve will be ______________.

6. If $E(X) = 2$, then $E(3X + 1) =$ ______________.

7. Let X and Y be two independent random variables with MGF $M_X(t)$ and $M_Y(t)$ respectively, then $M_{X+Y}(t)$ ______________.

P.T.O.

8. Write the normal equations for $Y = aX^b$.

9. Range of correlation coefficient is ________.

10. Let $b_{XY} > 1$, then b_{YX} is ________. **(10 × 1 = 10 Marks)**

SECTION – B

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

11. Define probability mass function.

12. Define conditional density.

13. Write the properties of a characteristic function.

14. Define conditional expectation.

15. Explain principle of least square.

16. Show that the correlation coefficient is invariant under location transformation.

17. Write the properties of scatter diagram.

18. What are the two regression lines, explain?

19. Define Spearman rank correlation.

20. Explain the transformation of a discrete random variable.

21. Write the properties of correlation coefficient.

22. What is relation connecting correlation coefficient and regression coefficients?

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries 4 marks :

23. For a pair (X,Y) of continuous random variables, show that $E(X+Y)=E(X)+E(Y)$.

24. Let X be a r.v with $f(x)=2e^{-2x}$, $x>0$ and $f(x)=0$, elsewhere. Obtain mean and variance of X.

25. State and prove addition theorem of expectation.

26. The joint probability distribution of two random variables is given by $f(x,y)=k(2x+y)^2$ for $x=0, 1, 2$ and $y=-1, 0, 1$. Find the conditional distributions of X given $Y=-1$ and Y given $X=1$.

27. Two r.v's X and Y have the joint p.d.f given by $f(x,y)=Kx^2y^3$, $0<x<y<1$, $f(x,y)=0$, elsewhere. Find the value K.

28. Derive the normal equations for $Y=ae^{bX}$.

29. Distinguishing between linear and curve *i*–linear fitting.

30. Find spearman rank correlation for the following data :

X	14	16	17	19	14	13	16
Y	10	11	12	10	13	13	10

31. Find the correlation coefficients from the two regression equations $5X+3Y=21$ and $3X+4Y=12$.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two** questions. Each question carries 15 marks :

32. Let X be discrete random variable function $f(x) = p(1-p)^x$, for $0 < p < 1$, $x = 0, 1, 2, \ldots$; 0, otherwise. Then

    (a) Show that $f(x)$ be probability mass function

    (b) Find Mean and variance

    (c) Find the distribution for $Y = X + 1$.

33. Let $f(X,Y) = K, 0 < x < y < 1; 0$, otherwise, be a bivariate probability density function of (X, Y). Then find

    (a) Correlation between X and Y

    (b) $E[\{X \mid Y\}]$

    (c) $P[X = Y]$.

34. Fit the model $Y = aX^b$ for the following data :

X	9	16	13	16	12	19	9	13	14
Y	10	11	13	15	11	13	10	12	11

35. The following data relate to the height of the plants and the weight of yield per plot recorded from 9 plots. Calculate the regression coefficients and hence correlation coefficient.

Height (in cms)	28	32	26	31	37	26	36	34	47
Frequency	72	78	67	89	92	69	76	70	89

(2 × 15 = 30 Marks)