

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MARCH 2017
(Supplementary – 2014 Admission)
SEMESTER II - COMPLEMENTARY COURSE (STATISTICS)
STA2TRV - THEORY OF RANDOM VARIABLES
(For Mathematics, Physics and Computer Applications)

Time: Three Hours

Maximum Marks: 80

Use of Scientific calculators and Statistical tables are permitted.

PART A

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

1. Define a Random variable.
2. If the p.d.f. of a random variable X is $f(x) = kx^2$; $0 < x < 1$, find k.
3. If $F(x) = \frac{3x^2 - x^3}{4}$; $0 < x < 2$, find the p.d.f. of X.
4. State the addition theorem on Expectation for two random variables X and Y.
5. Define Moment generating function of a random variable.
6. If $f(x) = \frac{1}{2}$, $-1 < x < 1$ is the p.d.f. of a random variable X, find $\phi_X(t)$.
7. A variable X assumes values 7,8 and 10. Find μ_2 .
8. Give the relation between correlation co-efficient and regression co-efficients of a bivariate data.
9. What is a Scatter diagram?
10. What is meant by Principle of least squares?

(10x1=10)

PART B

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

11. The joint p.d.f. of a bivariate random variable (X,Y) is $f(x,y) = x+y$; $0 < x < 1$, $0 < y < 1$, find the marginal p.d.f. of Y.
12. Show that $P[X=k] = 0$, where X is a continuous random variable and k is any real number.
13. If $f(x,y) = ke^{-x-2y}$; $x > 0$, $y > 0$ is the joint p.d.f. of (X,Y), find k.
14. A random variable X has p.d.f. $f(x) = 2^{-x}$; $x = 1,2,3, \dots$, find mode of the distribution.
15. For any two independent random variables, show that $E(XY) = E(X)E(Y)$.
16. A balanced die is tossed. A person receives Rs. 10/- if an even number turns up. Otherwise he loses Rs. 8/-. How much money can he expect on the average in the long run?
17. What is Kurtosis? Give any one measure of Kurtosis.
18. Given the second and third central moments of a distribution are 629.96 and 778173.91 respectively, find the moment measure of Skewness.

19. What are the normal equations to fit a curve of the form $y = ax^2 + bx + c$ to a given bivariate data?
20. Find Spearman's rank correlation for the following data
- | | | | | | |
|----|---|---|---|---|----|
| x: | 7 | 8 | 9 | 6 | 5 |
| y: | 8 | 6 | 7 | 9 | 10 |
21. State the properties of regression co-efficients of a bivariate data.
22. Given the two regression lines $8x - 10y + 66 = 0$ and $40x - 18y = 214$, identify the regression lines and find r.

(8x2 = 16)

PART C

III. Answer any six questions. Each question carries 4 marks.

23. An unbiased die is tossed till an odd number appears. Obtain the probability distribution of the number of tosses.
24. A random variable X has p.d.f. $f(x) = \frac{1}{4}$; $-2 < x < 2$. Obtain the p.d.f. of $Y = X^2$.
25. For a random variable X, $2 \log M_X(t) = 30t + 90t^2$. Find its mean, variance and third central moment.
26. State and prove Cauchy-Schwartz inequality.
27. The joint p.d.f. of (X,Y) is $f(x,y) = \frac{x+y}{21}$; $x=1,2,3$, $y=1,2$. Examine whether X and Y are independent.
28. Find Bowley's measure of Skewness from the following distribution
- | | | | | | |
|----|---|---|---|---|---|
| x: | 2 | 3 | 4 | 5 | 6 |
| y: | 1 | 3 | 7 | 4 | 1 |

29. Fit an equation of the form $y = ax + b$ to the following data
- | | | | | | | |
|----|---|----|----|----|----|----|
| x: | 1 | 3 | 5 | 7 | 8 | 10 |
| y: | 8 | 12 | 15 | 17 | 18 | 20 |
30. Derive the expression for Spearman's rank correlation co-efficient.
31. Derive the expression for the angle between the two regression lines of a bivariate data.

(6x4 = 24)

PART D

IV. Answer any two questions. Each question carries 15 marks.

32. The joint p.d.f. of (X,Y) is $f(x,y) = kx^2(1-y)$; $0 < x < 2$, $0 < y < 1$. Find (a) k
(b) $E(X|Y)$ (c) $V(X|Y)$ (d) Examine whether X and Y are independent.
33. Find any one co-efficient of skewness from the following data
- | | | | | | | | | |
|---------------|-------|-------|--------|---------|---------|---------|---------|---------|
| Wages | 70-80 | 80-90 | 90-100 | 100-110 | 110-120 | 120-130 | 130-140 | 140-150 |
| No.of workers | 52 | 68 | 85 | 92 | 100 | 95 | 70 | 28 |
34. Find Karl Pearson's co-efficient of correlation from the following data
- | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|
| x: | 90 | 82 | 82 | 81 | 71 | 63 | 63 | 49 | 38 |
| y: | 75 | 72 | 71 | 71 | 71 | 50 | 40 | 32 | 32 |
35. Given the following observations on a bivariate data (x,y), find the most probable value of x when y = 72
- | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|
| x: | 59 | 65 | 45 | 52 | 60 | 62 | 70 | 55 | 45 | 49 |
| y: | 75 | 70 | 55 | 65 | 60 | 69 | 80 | 65 | 59 | 61 |

(2x15=30)