TB142410C **Reg. No: ....**

Name: ....

B. Sc. DEGREE (C.B.C.S.S.) EXAMINATION, APRIL 2018
(2014 Admission Supplementary)
SEMESTER II - COMPLEMENTARY COURSE (STATISTICS)
STA2TRV – THEORY OF RANDOM VARIABLES
(Complementary for Mathematics, Physics and Core for 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. State the properties of p.d.f. of 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. Define distribution function of a random variable X.
4. For a discrete random variable X, show that E(aX + b) = aE(X) + b.
5. If the moment generating function of a random variable X is $(1 - t)^{-1}$, find E(X).
6. If $f(x) = \frac{1}{2}$, $-1 < x < 1$ is the p.d.f. of a random variable X, find $\varphi_X(t)$.
7. Give the formula for Bowley's co-efficient of skewness.
8. What are the limits within which the correlation co-efficient of a bivariate data must lie?
9. What is a Scatter diagram?
10. Give the relation between regression co-efficents and correlation co-efficient of a bivariate data.

(10x1=10)

PART B

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

11. Distinguish between Discrete and Continuous random variables.
12. Can the following be a probability density function?
    g(x) = ½ for x = 1
    = 2/3 for x = 0
    = ¼ for x = 2 and 0 elsewhere.
13. Find k if $f(x) = kx(1-x)$; $0 \le x \le 1$ and 0 elsewhere is a p.d.f of a continuous random variable.
14. For any two independent random variables X and Y, show that E (XY) = E(X) E(Y).
15. Define characteristic function of a random variable and state its important properties.
16. The joint p.d.f. of a bivariate random variable (X, Y) is
    $f(x, y) = x + y$; $0 < x < 1$, $0 < y < 1$, obtain the marginal p.d.f. of Y.
17. What is Sheppard's correction? Write down the Sheppard's correction for the first four moments.
18. The first three raw moments of a distribution are 1, 3 and 5 respectively. Find $_1$.
19. What are the normal equations to fit a curve of the form y = a + bx to a given bivariate data?

20. Find Spearman's rank correlation co-efficient from the following data.

Individuals:	A	B	C	D	E	F	G	H	I	J
Rank before:	1	6	3	9	5	2	7	10	8	4
Rank after:	6	8	3	2	7	10	5	9	4	1

21. Show that the regression lines of a bivariate data intersect at $(\bar{x}, \bar{y})$.
22. If the two regression equations of a bivariate data are $14x + 12y - 3 = 0$ and $12x + 21y + 10 = 0$, find co-efficient of correlation between x and y.

(8x2 = 16)

PART C

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

23. Write down the probability distribution of X and Y, where X denotes the sum of the numbers obtained and Y denotes the maximum of the numbers obtained.
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. Find the moment generating function of a random variable X whose p.d.f is $f(x) = a^x b$; x = 0,1,2,. . . . ., where a + b = 1.Hence find V(X).
26. State and prove Cauchy-Schwartz inequality.
27. If X and Y are any two random variables, show that E(E(X|Y)) = E(X).
28. For a distribution mean =3, variance = 4, $_1$ = +1 and $_2$ = 2. Obtain the first four moments about zero.
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. Show that Karl Pearson's co-efficient of correlation is independent of change of origin and scale.
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. Define conditional expectation and conditional variance If f(x,y)= x+y; 0<x<1, 0<y<1 is the joint p.d.f. of (X,Y), find correlation between X and Y.
33. What is Skewness? Obtain the moment measure of Skewness from the following data

Variable	5	10	15	20	25	30	35
Frequency	4	38	65	90	70	42	6

34. Find Karl Pearson's co-efficient of correlation and Spearman's rank correlation co-efficient from the following data

X:	115	109	112	87	98	120	98	100	98	118
Y:	75	73	85	70	76	82	65	73	68	80

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)