

K19U 0281

Reg. No. :

Name :

II Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.)
Examination, April 2019
(2014 Admission Onwards)

CORE COURSE IN STATISTICS 2B02STA: Probability Theory

Time: 3 Hours

Max. Marks: 48

PART – A (Short Answer)

Answer all the 6 questions.

 $(6 \times 1 = 6)$

- 1. State any two properties of distribution function.
- 2. When do you say that two random variables are independent?
- 3. Write down the range of correlation coefficient.
- 4. Define conditional variance.
- 5. Define probability generating function.
- 6. State any two properties of characteristic function.

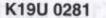
PART – B (Short Essay)

Answer any 7 questions.

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- 7. If A and B are independent events, show that A and B^c are independent events.
- 8. State and prove multiplication theorem of probability.

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- 9. Give classical definition of probability. Also give an example.
- Distinguish between marginal and conditional probability density functions.
- 11. If X has a uniform distribution in [0,1] with p.d.f.

$$f(x) = 1, 0 \le x \le 1$$

= 0, otherwise.

Find the p.d.f. of $Y = -2 \log X$.

- 12. State and prove addition theorem on expectation.
- 13. Establish the relation between raw and central moments.
- 14. The moment generating function of a random variable is $\frac{1}{(1-2t)^6}$, $t < \frac{1}{2}$.

Find the mean and variance.

15. Write a short note on the relationship between moments and cumulants

Answer any 4 questions.

 $(4 \times 4 = 16)$

- 16. Two groups are competing for the positions on the Board of Directors of a corporation. The probabilities that the first and second groups will win are 0.6 and 0.4 respectively. Furthermore, if the first group wins the probability of introducing a new product is 0.8 and the corresponding probability if the second group wins is 0.3. What is the probability that the new product will be introduced?
- Define conditional probability and show that it satisfies all the axioms of probability.

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18. The joint p.d.f. of two random variables X and Y is given by f(x, y) = 24x (1 - y), 0 < x < y < 1= 0, otherwise.

Find the marginal p.d.f.'s of X and Y.

- 19. Explain how you can get the joint p.d.f. from the marginal and conditional p.d.f.'s.
- 20. What do you mean by expectation of functions of random variables ? Let X be a random variable with probability mass function

Χ	0	1	2	3
f(x)	1/3	1/2	1/24	1/8

Find the expected value of $Y = (X - 1)^2$.

21. Explain how the moment generating function generates moments?

PART – D (Long Essay)

Answer any 2 questions.

 $(2 \times 6 = 12)$

- 22. Two events A and B are statistically independent. P(A) = 0.39, P(B) = 0.21 and $P(A \cup B) = 0.47$. Find the probability that
 - i) Neither A nor B will occur.
 - ii) Both A and B will occur.
 - iii) B will occur given that A has occurred.
 - iv) A will occur given that B has occurred.
- If f(x, y) = cx(1-y), 0 < x < y < 1 find (i) c (ii) the marginal distributions (iii) conditional distributions. Also examine whether the variables are independent.
- 24. State and prove Cauchy Schwartz's inequality.
- 25. If X and Y have the joint p.d.f. given by $f(x,y) = \frac{x+y}{21}$, x = 1, 2, 3; y = 1, 2. Obtain (i) the correlation coefficient ρ_{xy} (ii) E(X/Y = 2) and V(X/Y = 2).