Reg. No. : ....

Name : ....

K19U 0282

II Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.) Examination, April 2019
(2014 Admission Onwards)
COMPLEMENTARY COURSE IN STATISTICS (For Mathematics/ Comp. Science/Electronics Core)
Paper – 2C02STA : Probability Theory and Random Variables

Time : 3 Hours Max. Marks : 40

***Instruction** : Use of Calculators and Statistical Tables are **Permitted**.*

PART – A

Short answer. Answer **all** the **6** questions. **(6×1=6)**

1. What are the limitations of frequency definition of probability ?
2. What do you mean by sigma field ?
3. Give any one application of Baye's theorem.
4. State multiplication theorem of probability.
5. Define mutual independence of events.
6. Define marginal probability density functions.

PART – B

Short essay. Answer **any 6** questions. **(6×2=12)**

7. Define probability space.
8. If A, B, C are mutually independent events then show that $A \cup B$ and C are also independent.
9. If $P(A) = \frac{1}{3}$, $P(B) = \frac{3}{4}$ and $P(A \cup B) = \frac{11}{12}$, find P(A/B) and P(B/A).
10. Define distribution function. State any two properties.

P.T.O.

11. Define discrete random variable. Give an example.

12. When do you say that two random variables are independent ?

13. Define joint probability density function.

14. The joint probability density function of a two-dimensional random variable (X, Y) is given by

$$f(x, y) = 2; 0 < x < 1, 0 < y < x$$
$$= 0, \text{elsewhere}$$

. Find the marginal density function of X.

PART – C

Essay. Answer **any 4** questions. **(4×3=12)**

15. In an experiment a coin is thrown five times. Write down the sample space. How many points are there in the sample space ?

16. Define axiomatic definition of probability.

17. The chances of X, Y, Z becoming managers of a certain company are 4:2:3. The probabilities that bonus scheme will be introduced if X, Y, Z become managers, are 0.3, 0.5 and 0.8 respectively. If the bonus scheme has been introduced, what is the probability that X is appointed as the manager.

18. If X is a random variable with probability mass function

$$p(x) = \frac{x^2}{30}, x = 1, 2, 3, 4$$
$$= 0, \text{ otherwise}$$

write down the distribution function of X.

19. If X has the p.d.f. $f(x) = e^{-x}$, $x > 0$ find the p.d.f. of $Y = e^{-x}$.

20. If the joint p.d.f. of (X, Y) is

$$f(x, y) = \frac{1}{9}(x + 1)(2y + 1), 0 < x < 1, 0 < y < 2$$
$$= 0, \text{ otherwise}$$

. Find the marginal distributions of X and Y. Are the random variables X and Y independent ?

PART – D

Long Essay. Answer **any 2** questions. **(2×5=10)**

21. State and prove addition theorem for three events.

22. A, B and C are three arbitrary events. Find expressions for the events noted below, in the context of A, B and C.

    i) Only A occurs

    ii) Both A and B, but not, occur

    iii) All three events occur

    iv) At least one occurs

    v) At least two occurs.

23. State and prove Baye's theorem.

24. The length (in hours) X of a certain type of light bulb may be supposed to be a continuous random variable with probability density function :

$$f(x) = \frac{a}{x^3}, 1500 < x < 2500$$
$$= 0, \text{elsewhere}$$

Determine the constant a, the distribution function of X and compute the probability of the event $1700 \le X \le 1900$.