



K19U 0282

Reg. No. : .....

Name : .....

**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  $1700 \leq X \leq 1900$ .

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