K16U 1238

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (CCSS – Reg./Supple./Improv.) Examination, May 2016
(2014 Admn. Onwards)
COMPLEMENTARY COURSE IN STATISTICS (For Mathematics/ Computer Science Core)
2C02 STA : Probability Theory and Random Variables

Time : 3 Hours Max. Marks : 40

PART – A

Answer **all 6** questions. **(6×1=6)**

1. Define sample space and event.

2. Define classical definition of probability.

3. Define conditional probability.

4. Define distribution function of a random variable.

5. Define random variable.

6. Define independence of random variables.

PART – B

Answer **6** questions : **(6×2=12)**

7. State the axioms of probability.

8. State and prove addition theorem on probability.

P.T.O.

9. Three perfect coins are tossed together what is the probability of getting at least one head.

10. If A and B are independent events show that $\overline{A}$ and $\overline{B}$ are independent events.

11. A continuous random variable X follows the probability law $f(x) = Ax^2, 0 < x < 1$. Find the value of K.

12. An unbiased coin is tossed 4 times. If X denote the number of times head turns up. Find the probability distribution of X.

13. A random variable X has the density function $f(x) = \begin{cases} 1/4 & -2 < x < 2 \\ 0 & \text{otherwise} \end{cases}$.

    Find $P[|X| > 1]$.

14. Let X be a random variable with p.d.f. $f(x) = \begin{cases} 2x, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$. Find the p.d.f. of

    $Y = 3X + 1$.

PART – C

Answer **any 4** questions : **(4×3=12)**

15. A person is known to hit the target is 3 out of 4 shots whereas another person is known to hit the target is 2 out of 3 shots. Find the probability of the target being hit at all when they both try.

16. Define pairwise independence and mutual independence. Is pairwise independence implies mutual independence ? Justify your answer.

17. State and prove Bayes theorem.

18. Prove that $P\left(A \cup B / C\right) = P\left(A/C\right) + P\left(B/C\right) - P\left(A \cap B / C\right)$.

19. Let $f(x, y) = 8xy$, $0 < x < y < 1$ and zero otherwise. Find the marginal distributions of X and Y.

20. Let X be a random variable with p.d.f. $f(x) = \begin{cases} \frac{1}{2}, & -1 < x < 1 \\ 0, & \text{otherwise} \end{cases}$. Find the distribution function of X and the p.d.f. of $Y = X^2$.

PART – D

Answer **any 2** questions : **(2×5=10)**

21. a) A bag contains 5 white and 3 black balls. Two balls are drawn at random one after the another without the replacement. Find the probability that both balls drawn are black.

    b) A bag contains 8 white and 4 red balls. Five balls are drawn at random what is the probability that 2 of them are red and 3 are white ?

22. 4 coins are tossed. Let X be the number of heads and Y be the number of heads minus the number of tails. Find the probability function of X, the probability function of Y and $P(-2 \le Y < 4)$.

23. Let X and Y be jointly distributed with p.d.f. $f(x, y) = \begin{cases} \frac{1}{4}(1 + xy) & |x| < 1,\ |y| < 1 \\ 0 & \text{otherwise} \end{cases}$.

    Show that X and Y are not independent but X^2 and Y^2 are independent.

24. The following table represents joint probability distribution of the random variables X, Y.

	X	1	2	3
Y	1	$\frac{1}{12}$	$\frac{1}{6}$	0
	2	0	$\frac{1}{9}$	$\frac{1}{5}$
	3	$\frac{1}{18}$	$\frac{1}{4}$	$\frac{2}{15}$

1) Find the marginal distribution of X and Y.
2) Evaluate the conditional distribution of Y give X = 2.