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 $f(x) = \begin{cases} \frac{1}{4} & -2 < x < 2 \\ 0 & \text{otherwise} \end{cases}$.

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 $P(-2 \leq Y < 4)$.

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 | $1/12$ | $1/6$ | 0 |
| | 2 | 0 | $1/9$ | $1/5$ |
| | 3 | $1/18$ | $1/4$ | $2/15$ |

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

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