K18U 0518

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (C.B.C.S.S. – Reg./Supple./Imp.) Examination, May 2018
COMPLEMENTARY COURSE IN STATISTICS
(for Mathematics/Comp. Science/Electronics Core)
2C02 STA : Probability Theory and Random Variables
(2014 Admn. Onwards)

Time : 3 Hours Total Marks : 40

PART – A

(Short Answer)

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

1. What are the limitations of classical definition of probability ?
2. State addition theorem for three events.
3. State Baye's theorem.
4. Define conditional probability.
5. When do you say that two events are independent ?
6. Define joint probability density function.

PART – B

(Short Essay)

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

7. Give axiomatic definition of probability.
8. Give an example to show that pairwise independence does not imply mutual independence.
9. Show that conditional probability satisfies all the axioms.

P.T.O.

10. Distinguish between discrete and continuous random variables.

11. Let X be a random variable with probability distribution

x	–1	0	1
p(x)	$\frac{11}{32}$	$\frac{1}{2}$	$\frac{5}{32}$

Find the probability distribution of X^2.

12. If X and Y have the joint p.d.f. $f(x, y) = x + y$, $0 < x, y < 1$, find $P(0 < X < \frac{1}{2}, \frac{1}{2} < Y < 1)$.

13. Find k so that $f(x, y) = kx(y - x)$, $0 \leq x \leq 4$, $4 \leq y \leq 8$ will be a bivariate probability density function.

14. The joint p.d.f. of two random variables X and Y is given by $P(X = 0, Y = 1) = \frac{1}{3}$, $P(X = 1, Y = -1) = \frac{1}{3}$, $P(X = 1, Y = 1) = \frac{1}{3}$. Find the marginal p.d.f's of X and Y.

PART – C

(Essay)

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

15. A town has two doctors X and Y operating independently. If the probability that doctor X is available is 0.9 and that for Y is 0.8. What is the probability that atleast one doctor is available when needed ?

16. Distinguish between classical and frequency definitions of probability.

17. In a factory machines A and B are producing springs of the same type. Of this production, machines A and B produce 5% and 10% defective springs, respectively. Machines A and B produce 40% and 60% of the total output of the factory. One spring is selected at random and it is found to be defective. What is the possibility that this defective spring was produced by machine A ?

18. Define distribution function and state its properties.

19. Suppose that X has p.d.f., $f(x) = 2x, 0 < x < 1$
$= 0$, elsewhere.

Find the p.d.f. of $Y = 3X + 1$.

20. If $f(x, y) = \frac{4}{5}(x + y + xy), 0 \leq x \leq 1, 0 \leq y \leq 1$, are the variables independent ?

PART – D

(Long Essay)

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

21. State and prove addition theorem for two events.

22. From a group of 3 Indians, 4 Pakistanis and 5 Americans a sub-committee of four people is selected by lots. Find the probability that the sub-committee will consist of
    i) 2 Indians and 2 Pakistanis
    ii) 1 Indian, 1 Pakistani and 2 Americans
    iii) 4 Americans.

23. Given $P(A) = 0.5$ and $P(A \cup B) = 0.7$. Find $P(B)$ if (i) A and B are independent (ii) A and B are mutually exclusive and (iii) $P(A|B) = 0.5$.

24. Given

$$f(x) = kx(1 - x), 0 < x < 1$$
$$= 0, \text{ elsewhere.}$$

Find k and the distribution function.
