K20U 0327

Reg. No. : ....

Name : ....

II Semester B.Sc. Degree (CBCSS-Supplementary/Improvement) Examination, April 2020
(2014-2018 Admissions)
COMPLEMENTARY COURSE IN STATISTICS (For Mathematics/ Comp.Science /Electronics Core)
2C02 STA : Probability Theory and Random Variables

Time : 3 Hours   Max. Marks : 40

PART – A

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

1. Define a sigma field.
2. State the addition theorem of probability.
3. Define independence of two events.
4. Given an example each for discrete and continuous random variable.
5. Define distribution function of a random variable.
6. Define conditional distribution of X given Y.

PART – B

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

7. Write the limitations of classical definition of probability.
8. Given $P(A) = \frac{1}{3}, P(B) = \frac{1}{4}, P(A \cup B) = \frac{2}{3}$. Is this statement correct ? Verify.
9. Write the axiomatic definition of probability.
10. If P(A) = 0.6, P(B) = 0.8, find $P(A \cup B)$ when A and B are independent.

P.T.O.

11. Write the expressions for the following in the case of two events

    i) Exactly one of the events occur

    ii) At least one of the events occur.

12. Find the constant k, if X has the following probability mass function (p.m.f.)

X	0	1	2	3	4	5
P (X=x)	k	0.2	3k	0.1	0.3	0.1

13. If X has the density function $f(x) = 1,\ 0 \le x \le 1$ find (a) $P(X < 1/2)$, (b) $P\left(\frac{1}{4} < X < \frac{1}{3}\right)$.

14. Define joint probability distribution of two random variables X and Y.

PART – C

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

15. Define i) equally likely events ii) Disjoint events.

16. A and B are events such that $P(A \cup B) = 3/4, P(A \cap B) = \frac{1}{4}$ and $P(A^c) = 2/3$ find P(A), P(B).

17. Two events A and B have, $P(A) = P(A/B) = 1/4$ and $P(B/A) = 1/2$. Are A and B independent events ? Explain Why ?

18. A random variable X has the following probability mass function.

x	– 2	– 1	0	1	2	3
f(x)	0.15	0.25	0.35	0.10	0.10	0.05

    Obtain the distribution function.

19. If (X, Y) has the joint density $f(x, y) = e^{-(x+y)}, x > 0, y > 0$; find $P(X \le 1)$.

20. If the joint p.m.f of X and Y is

    $f(x, y) = \frac{1}{4}$ when $(x, y) = \{(0, 0), (1, 0), (0, 1), (1,1)\}$.

    examine whether X and Y are independent.

PART – D

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

21. i) One bag contains 4 white balls and 2 black balls ; another contains 3 white balls and 5 black balls. If one ball is drawn from each bag, find the probability that (a) both are white (b) both are black (c) one is white and one is black.

    ii) Prove the following a) $P(A^c) = 1 - P(A)$ b) P(a sure event) = 1.

22. i) State and prove Bayes theorem.

    ii) Show that if A and B are independent events, A^c and B^c are independent events.

23. The density function of X is

    $$f(x) = \left(\frac{3}{2}\right)x^2, -1 < x < 1.$$

    Find the p.d.f. of $Y = \frac{x^3 + 1}{2}$.

24. Let X and Y have the joint density $f(x, y) = 2, 0 \le x \le y \le 1$. Find the marginal densities and the conditional density of Y given X = x.
