21U241 (Pages: 2) Name: ....

Reg.No: ....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL 2022

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U STA2 C02 - PROBABILITY THEORY

(Statistics - Complementary Course)

(2019 Admission onwards)

Time : 2.00 Hours Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 2 marks.

1. Define simple event.
2. State the a priori definition of probability.
3. What are the limitations of classical definition of probability?
4. State the properties of probability density function.
5. If the cumulative distribution function of X is $F(x)$, find the cumulative distribution function of $Y=X-b$
6. Show that $E(aX+b)=aE(X)+b$.
7. List any two properties of variance.
8. Define characteristic function.
9. Define Skewness.
10. What is joint probability density function?
11. Define marginal distributions.
12. If X and Y are independent r.v.s, show that Cov(x,y)=0.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer ***all*** questions. Each question carries 5 marks.

13. Given $P(A)=0.30, P(B)=0.78$ and $P(A\cap B)=0.16$. Find $\mbox{(i)}~P(A\cup B)~\mbox{(ii)}~P(A^c\cap B)~\mbox{(iii)}~P(A\cup B)^c$.
14. The diameter of an electric cable, say $X,$ is assumed to be a continuous random variable with pdf, $f(x)= 6x(1-x),~~0\leq x\leq1.$ Compute $P\left(X \leq\displaystyle\frac{1}{2}\mid\displaystyle\frac{1}{3}\leq X\leq\displaystyle\frac{2}{3}\right).$
15. State and prove the multiplication theorem of probability.
16. Prove or disprove: Pairwise independence does not imply Mutual independence.
17. Define a stochastic variable and give an example.
18. Find the mgf of $X$with pdf $f(x)=\frac{1}{2}e^{-|x|},-\infty<x<\infty$.
19. Given the joint pdf of X and Y as $\begin{split} f(x,y)& = 21x^2y^3, 0<x<y<1 \\ & = 0, elsewhere \end{split}$. Find the marginal distribution of X and Y. Also verify whether X and Y are independent?

(Ceiling: 30 Marks)

Part C (Essay questions)

Answer any ***one*** question. The question carries 10 marks.

20. (i) What do you mean by change of variable technique?
(ii) The random variable X has the p.d.f:$f(x)= e^{-x},o\leq x<\infty$. Find the p.d.f of the random variable
$Y= 3X+5.$
21. Let the joint pdf of (X,Y) be:
$f(x,y)=\left\{ \begin{array}{ll} 3xy, & 0\leq x\leq1; 0\leq y\leq1; 0\leq x+y\leq1 \\ 0, & \hbox{elsewhere.} \end{array} \right.$
Find (i) $E(Y|X=x)$; and (ii) Cor (X,Y).

(1 × 10 = 10 Marks)

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