23U371 (Pages: 2) Name: ....

Reg.No: ....

THIRD SEMESTER B.Voc. DEGREE EXAMINATION, NOVEMBER 2024

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC21U SDC3 PT08 - PROBABILITY THEORY

(Information Technology)

(2021 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. State statistical definition of probability.
2. What are the axioms of probability?
3. State the multiplication theorem.
4. Define a random variable.
5. Define probability density function.
6. State the properties of probability density function.
7. Show that $V(aX) = a^2V(X)$.
8. Define characteristic function of a random variable.
9. What do you mean by kurtosis?
10. Write the properties of joint probability density function.
11. Define statistical independence of two random variables.
12. What do you mean by conditional expectation?

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

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

13. The diameter of an electric cable, say X, is assumed to be a continuous random variable with pdf, $f(x) = 6x(1-x),\ \ 0 \leq x \leq 1$. Compute $P\left(X \leq \frac{1}{2} \mid \frac{1}{3} \leq X \leq \frac{2}{3}\right)$.
14. A problem in Statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved if all of them try independently?
15. If the cumulative distribution function of X is $F(x)$, find the cumulative distribution function of (i) $Y = X + a$, (ii) $Y = aX$.

16. If X has the pdf $f(x) = \begin{cases} 1, & 0 \leq x \leq 1; \\ 0, & \text{elsewhere.} \end{cases}$ Find the pdf of $-2\log X$.

17. State and explain the properties of expectation.

18. A two dimentional random variable (X,Y) have the joint density $\begin{aligned} f(x,y) &= 8xy, 0 < x < y < 1 \\ &= 0, otherwise \end{aligned}$. Find the marginal and conditional distribution of X and Y.

19. In two independent random variables X and Y show that $M_{X+Y}(t) = M_X(t)M_Y(t)$

(Ceiling: 30 Marks)

Part C (Essay questions)

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

20. State and establish Baye's theorem for a countable number of events.

21. If $f(x) = ke^{-|x|}, -\infty < x < \infty$ is the pdf of a random variable X. Find

(a) k

(b) Mean

(c) Standard deviation

(d) mgf.

(1 × 10 = 10 Marks)

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