22U371 (Pages: 2) Name: .....

Reg.No: .....

THIRD SEMESTER B.Voc. DEGREE EXAMINATION, NOVEMBER 2023

(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. Define equally likely events.
2. Two unbiased dice are thrown. Find the probability that the product of the numbers coming up is 12.
3. What are the two types of random variables?
4. Define probability density function.
5. State the properties of probability density function.
6. If the cumulative distribution function of X is $F(x)$, find the cumulative distribution function of $Y = aX$
7. Mention any two properties of expectation.
8. List any two properties of variance.
9. State any two properties of mgf.
10. Define characteristic function of a random variable.
11. Define statistical independence of two random variables.
12. Define conditional expectation.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

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

13. Let A and B be two events in a sample space. Show that $P(A \cap B) \leq P(A) \leq P(A \cup B) \leq P(A) + P(B)$.
14. Given $P(A) = 0.30, P(B) = 0.78$ and $P(A \cap B) = 0.16$. Find (i) $P(A \cup B)$ (ii) $P(A^c \cap B)$ (iii) $P(A \cup B)^c$.

15. Let A and$B$ be two events such that, $P(A \cup B) = 0.8, P(A) = 0.4$ and $P(A \cap B) = 0.3$, then $P(A \cap B^c)$.

16. Distinguish between skewness and kurtosis.

17. If the joint pdf of X & Y $f(x, y) = kx(y - x), 0 < x < 4; 4 < y < 8$, find the value of k

18. Explain how you can get the joint p.d.f from the marginal and conditional p.d.f's?

19. Give an example to show that pairwise independence does not imply mutual independence.

(Ceiling: 30 Marks)

Part C (Essay questions)

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

20. (i) State and prove Baye's theorem.

    (ii) Two urns I and II contain respectively 3 white and 2 black balls, 2 white and 4 black balls. One ball is transferred from urn I to urn II and then one is drawn from the latter. It happens to be white. What is the probability that the transferred ball was white?

21. Item Let X be a random variable with pdf:

$$f(x) = \begin{cases} kx, & 0 < x < 1 \\ 0, & \text{elsewhere.} \end{cases}$$

    (i) Find k.

    (ii) Obtain the pdf of $Y = e^{-X}$.

(1 × 10 = 10 Marks)

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