24U3108 (Pages: 2) Name : .....

Reg. No : .....

THIRD SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(FYUGP)

CC24USTA3MN203 - RANDOM VARIABLES AND CART

(Statistics - Minor Course)

(2024 Admission - Regular)

Time: 2.0 Hours Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 3 marks.

1. Given a function, how will you verify whether it is a pdf or not. [Level:2] [CO1]
2. Describe a random variable. [Level:2] [CO1]
3. What is a continuous random variable? [Level:2] [CO1]
4. What is a discrete random variable? [Level:2] [CO1]
5. Discuss the concept of distribution function. [Level:2] [CO1]
6. Discuss normal distribution. [Level:2] [CO2]
7. The mean of a binomial distribution is 20 and its variance is 10. Verify whether this is possible and find n and p. [Level:2] [CO2]
8. Explain the use of predictor variables in statistical learning. [Level:2] [CO3]
9. What is statistical learning? [Level:2] [CO3]
10. Discuss the properties of mathematical expectation. [Level:2] [CO4]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer ***all*** questions. Each question carries 6 marks.

11. A random variable X has the following density function [Level:3] [CO1]

$$f(n) = \begin{cases} ax & \text{if } 0 \leq x \leq 1 \\ a & \text{if } 1 \leq x \leq 2 \\ -a + 3a & \text{if } 2 \leq x < 3 \\ 0 & \text{if } otherwise \end{cases}$$

(i) Determine the constant 'a'.

(ii) Compute $P(1 < x < 2)$.

12. Let X be a continuous random variable whose density function is given below [Level:3] [CO1]

(i) Determine k. (ii) Determine the distribution function of X.

$$f(x) = \begin{cases} k & \text{if } a \leq x \leq b\} \\ 0 & otherwise \end{cases}$$

13. Derive the mgf of Poisson distribution. [Level:2] [CO2]

14. The average IQ of a group of 800 children is 98. The standard deviation is 8. Assuming normality, find the expected number of children having IQ between 100 and 120. [Level:3] [CO2]

15. Describe the different classification algorithms. [Level:2] [CO4]

16. Discuss how CART works for classification. [Level:2] [CO4]

17. Explain how bagging works. [Level:2] [CO4]

18. Describe random forest. [Level:2] [CO4]

(Ceiling: 36 Marks)

Part C (Essay questions)

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

19. Show that binomial distribution tends to normal distribution as n very large. [Level:2] [CO2]

20. Discuss supervised learning. What are the types of different supervised learning algorithm? [Level:2] [CO3]

(1 × 10 = 10 Marks)

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