CUET (UG) – MATHEMATICS

Chapter Test - Probability Distributions: Random Variables

General Instructions

1. Total Questions: **20**
2. Duration: **60 Minutes**
3. All questions are compulsory.
4. Each question carries **5 marks**.
5. For each correct answer: **+5 marks**.
6. For each incorrect answer: **-1 mark**.
7. No negative marking for unanswered questions.
8. Use of calculator or electronic devices is strictly prohibited.
9. Choose the most appropriate answer from the given options.

1. A random variable X has the following probability distribution:
   $P(X = x)$: $\quad 0.1, \quad k, \quad 0.2, \quad 2k, \quad 0.3$ for $x = 0, 1, 2, 3, 4$ respectively.
   The value of k is:
   (A) 0.1
   (B) 0.2
   (C) 0.133
   (D) 0.4

2. Let X be a discrete random variable. The sum of all probabilities in the probability distribution of X is always:
   (A) 0
   (B) Between 0 and 1
   (C) 1
   (D) Any positive real number

3. For a random variable X, $E(X^2) = 25$ and $E(X) = 4$. The variance $Var(X)$ is:
   (A) 9
   (B) 21
   (C) 5
   (D) 41

4. If X is a random variable such that $E(X) = 3$ and $Var(X) = 2$, then $E(3X + 5)$ is:
   (A) 14
   (B) 11
   (C) 15
   (D) 9

5. A coin is tossed three times. Let X be the number of heads. The possible values of X are:
   (A) $\{1, 2, 3\}$
   (B) $\{0, 1, 2\}$
   (C) $\{0, 1, 2, 3\}$
   (D) $\{1, 2\}$

6. The probability distribution of a random variable X is given by $P(X = x) = \frac{x}{15}$ for $x = 1, 2, 3, 4, 5$. The expectation $E(X)$ is:
   (A) 3
   (B) 3.66
   (C) 11/3
   (D) 55/15

7. If $Var(X) = 4$, then $Var(2X + 3)$ is:
   (A) 8
   (B) 11
   (C) 16
   (D) 19

8. A random variable X takes values 0, 1, 2 with probabilities $1/3, 1/6, 1/2$ respectively. The value of $E(3X^2)$ is:
   (A) 6.5
   (B) 7.5
   (C) 2.16
   (D) 4.5

9. The range of a random variable defined as the number of tails in 5 tosses of a coin is:
   (A) $\{1, 2, 3, 4, 5\}$

(B) $\{0, 1, 2, 3, 4\}$
(C) $\{0, 1, 2, 3, 4, 5\}$
(D) $\{1, 5\}$

10. If $P(X = x) = C(2^x)$ for $x = 0, 1, 2$, then the constant C is:
(A) 1/7
(B) 1/3
(C) 1/6
(D) 1/4

11. For a random variable X, $E(X) = 10$ and $Var(X) = 25$. The coefficient of variation is:
(A) 50%
(B) 250%
(C) 40%
(D) 25%

12. Let X be a random variable representing the outcome of a fair die. The mean of X is:
(A) 3
(B) 3.5
(C) 4
(D) 2.5

13. The variance of a constant a is:
(A) a
(B) a^2
(C) 1
(D) 0

14. If $E(X) = \mu$, then $E(X - \mu)$ is:
(A) μ
(B) 0
(C) $Var(X)$
(D) 1

15. A box contains 2 red and 3 black balls. Two balls are drawn at random with replacement. Let X be the number of red balls. $P(X = 1)$ is:
(A) 4/25
(B) 6/25
(C) 12/25
(D) 9/25

16. Which of the following cannot be a probability distribution of a random variable X?
(A) $P(x) : 0.3, 0.4, 0.3$
(B) $P(x) : 0.1, 0.5, 0.4$
(C) $P(x) : 0.6, 0.5, -0.1$
(D) $P(x) : 1, 0, 0$

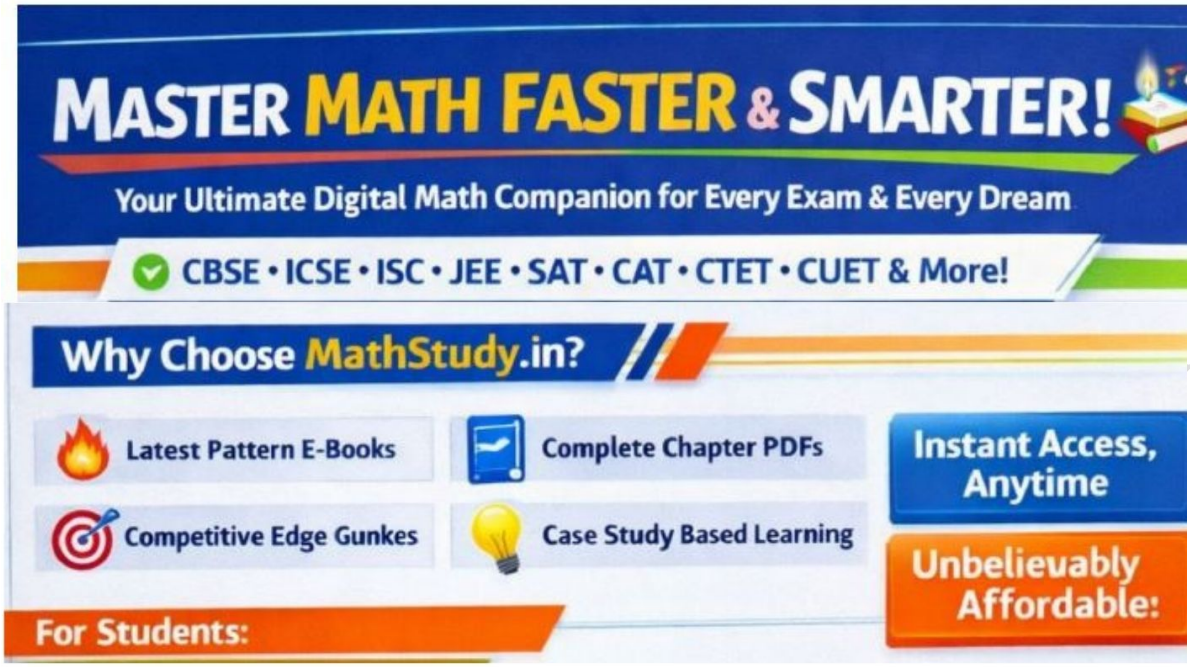
17. If X is a random variable and k is a constant, then $Var(kX)$ is:
(A) $kVar(X)$
(B) $k^2Var(X)$
(C) $Var(X)$
(D) 0

18. The standard deviation of a random variable X whose distribution is $P(X = 0) = 0.5, P(X = 1) = 0.5$ is:

(A) 0.5
(B) 0.25
(C) 1
(D) 0.75

19. Let X be the number of hours a student studies. $P(X = x) = kx$ for $x = 1, 2, 3$ and $P(X = x) = k(6 - x)$ for $x = 4, 5$. The value of k is:
(A) 1/6
(B) 1/9
(C) 1/12
(D) 1/15

20. A discrete random variable X has mean 2 and variance 1. The value of $E(X^2 + 2X)$ is:
(A) 5
(B) 7
(C) 9
(D) 10



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