MANIPAL INSTITUTE OF TECHNOLOGY

BENGALURU

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QUIZ

IV SEMESTER (CSE / AI / CYBER / IT)

ENGINEERING MATHEMATICS IV (MAT_2226)

Max Marks: 10 | **Duration: 30 minutes**

Date: 05-02-2024 | **Time: 12.00-12.30 PM**

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10/10

Sl.No	1	2	3	4	5	6	7	8	9	10
Option	b)	c)	19	a)	c)	b)	c)	c)	B)	xe^{-x}

Sl.No	MCQ	Marks
1.	Three numbers are chosen from 1 to 20. The probability that they are not consecutive is a) $\frac{186}{190}$ b) $\frac{187}{190}$ c) $\frac{170}{190}$ d) $\frac{189}{190}$	1
2.	The chances that doctor A will diagnose a disease X correctly is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of doctor A, who had disease X. died. What is the chance that his disease was diagnosed correctly? a) $\frac{8}{23}$ b) $\frac{6}{18}$ c) $\frac{6}{13}$ d) $\frac{8}{13}$	1
3.	When E(X)=3 find E(5X+4)= 19.	1
4.	A fair dice is thrown. Let A denotes the event 'getting even number' and B denotes the event 'getting multiple of 3'. Then choose the correct option a. $P(A \cap B) = P(A)P(B)$ b. $P(A \cap B) < P(A)P(B)$ c. $P(A \cap B) > P(A)P(B)$ d. $P(A) = P(B)$.	1
5.	Let E and F be two events with $P(E \cup F) = 0.6$, $P(E) = 0.3$, $P(F) = 0.4$. Then $P(E \cap F^C) + P(E^C \cap F)$ equals a) 0.3 b) 0.4 c) 0.5 d) 0.6	1
6.	A box contains 7 non-defective and 3 defective bulbs. Two bulbs are chosen at random from the box. The probability that at least one bulb is defective is a) 8/11 b) 8/15 c) 8/17 d) 8/19	1

7.	Var(4X+8) is a). 12 Var(X) b). 4 Var (X)+8 c). 16 Var(X) d). 16 Var (X)+8	1
8.	Let a pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice. Find the mean or expectation of X. a). 5 b). 6 c). 7 d).8	1
9.	Find the variance of the number obtained on a throw of an unbiased die. a). 33/12 b). 35/12 c). 37/12 d). 39/12	1
10.	If $F(x) = 1 - e^{-x} - xe^{-x}$ then f(X) is $x e^{-x}$.	1

Formula:

Addition rule: If A and B are two events of an experiment having sample space S, then $P(A \cup B) = P(A) + P(B) - P(A \cap B)$.

The conditional probability of an event B, given that the event A already taken place is

$$P(B/A) = \frac{P(A \cap B)}{P(A)}, \quad P(A) > 0.$$

Baye's Theorem:

Let $B_1, B_2, \ldots B_k$ are the partitions of S with $P(B_i) \neq 0, i = 1,2,\ldots k$ and A be any event of S, then

$$P(B_i / A) = \frac{P(A/B_i)P(B_i)}{\sum_{i=1}^{k} P(A/B_i)P(B_i)}.$$

The multiplicative rule of probability : $P(A \cap B) = \begin{cases} P(A)P(B|A), if\ P(A) \neq 0 \\ P(B)P(A|B), if\ P(B) \neq 0 \end{cases}$

If $P(A \cap B) = P(A)P(B)$, then A and B are independent.

Continuous Random Variable: A random variable X is said to be continuous if it can take all possible values between certain limits, here the range space of X is infinite. Therefore the probability distribution function named for such random variable is Probability density function (PDF), which is defined as the pdf of X is a function $f(x)$ satisfying the following properties i) $f(x) \geq 0$

ii) $\int_{-\infty}^{\infty} f(x)dx = 1$

iii) $\Pr\{a \leq X \leq b\} = \int_a^b f(x)dx$ for any a, b such that $-\infty < a < b < \infty$.

Note: 1. If X is a continuous random variable with pdf f(x), then

$P(a < X < b) = P(a \leq X < b) = P(a < X \leq b) = P(a \leq X \leq b) = \int_a^b f(x)dx$.

2. $P(X = a) = 0$, if X is a continuous random variable.

Cumulative distribution function: Let X be random variable (discrete or continuous), we define F to be the cumulative distribution function of a random variable X given by $F(x) = \Pr\{X \leq x\}$.

Case i) If X is discrete random variable then

$$F(t) = \Pr\{X \leq t\} = P(x_1) + P(x_2) + \cdots + P(t)$$

Case ii) If x is a continuous random variable then $F(x) = \Pr\{X \leq x\} = \int_{-\infty}^{x} f(x)dx$.

Mathematical Expectation: If X is a discrete random variable with pmf p(x), then the expectation of X is given by $E(X) = \sum_x xp(x)$, provided the series is absolutely convergent.

If X is continuous with pdf f(x), then the expectation of X is given by $E(X) = \int xf(x)dx$, provided $\int |x| f(x)dx < \infty$.

Variance of X is given by $V(X) = E(X - E(X))^2 = E(X^2) - (E(X))^2$.