



KIIT Deemed to be University
Online Mid Semester Examination(Spring Semester-2021)

Subject Name & Code: Probability and Statistics & MA-2011
Applicable to Courses: B. Tech, 4th Semester (CSSE branch)

Full Marks=20

Time:1 Hour

SECTION-A(Answer All Questions. All questions carry 2 Marks)

Time:20 Minutes

(5×2=10 Marks)

| Question No | Question Type(MCQ/SAT) | Question | CO Mapping |
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| Q.No:1(a) | | <p>If A and B are mutually exclusive and exhaustive events for sample space S then</p> <p>(a) $P(A \cup B) = P(A) + P(B)$</p> <p>(b) $P(A \cap B) = 0$</p> <p>(c) $P(A \cup B) = 1$</p> <p>(d) All of above</p> <p>Answer: d</p> | CO-1 |
| | | <p>If A and B are independent events with $P(A) = 0.25$ and $P(B) = 0.75$ then $P(A \cup B)$ is</p> <p>(a) 1</p> <p>(b) 0.8725</p> <p>(c) 0.8125</p> <p>(d) 0</p> <p>Answer: c</p> | CO-1 |
| | | <p>If A and B are mutually exclusive events with $P(\bar{A}) = 0.35$ and $P(B) = 0.15$ then $P(A \cup B)$ is</p> <p>(a) 0</p> <p>(b) 0.80</p> <p>(c) 0.50</p> <p>(d) 0.15</p> <p>Answer: b</p> | CO-1 |
| | | <p>If E and F are independent events then $P(E F)$ is</p> <p>(a) $P(E) \cdot P(F)$</p> <p>(b) $P(F)$</p> <p>(c) $P(E)$</p> <p>(d) Options (a) and (c) both</p> <p>Answer: c</p> | CO-1 |
| Q.No:1(b) | | <p>Let A, B and C be three events with probabilities $P(A) = 0.4$, $P(B) = 0.55$, $P(C) = 0.7$, $P(A \cap B) = 0.32$, $P(A \cap C) = 0.33$, $P(B \cap C) = 0.45$ and $P(A \cup B \cup C) = 0.85$. What is the value of $P(A \cap B \cap C)$?</p> <p>a. 0.3</p> <p>b. 0.4</p> <p>c. 0.5</p> <p>d. 0.2</p> <p>Ans: a</p> | CO-2 |
| | | <p>Let A_1, A_2, A_3 be three mutually exclusive and exhaustive events and B be an arbitrary event. Given that $P(A_1) = 0.4$, $P(A_2) = 0.35$, $P(B A_1) = 0.3$, $P(B A_2) = 0.6$ and</p> | CO-2 |

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| | | $P(B A_3) = 0.5$, then $P(B)$ is a. 0.355 b. 0.405 c. 0.455 d. 0.5 Ans: c | |
| | | For any real $t > 0$, the random variable X is defined for $X^2 \geq t^2$ and 0 otherwise. The random variable Y is defined by $Y = 0$ for $X^2 < t^2$ and t^2 for $X^2 \geq t^2$. Expectation of the r.v. Y is a. $t^2 P(X^2 \geq t^2)$ b. $t P(X > t)$ c. $\sum_t^\infty t P(X \geq t)$ d. $t P(X^2 \geq t^2)$ Ans: a | CO-2 |
| | | If A and B are two independent events with $P(A) = 0.7$, $P(B') = 0.6$ then $P(A \cup B)$ is a. 0.82 b. 0.88 c. 0.11 d. 0.13 Ans: a | CO-2 |
| Q.No:1(c) | | The cdf of the rv X is as follows: $F(x) = \begin{cases} 0, & x < 0; \\ 0.06, & 0 \leq x < 1; \\ 0.19, & 1 \leq x < 2; \\ 0.39, & 2 \leq x < 3; \\ 0.67, & 3 \leq x \leq 4; \\ 0.92, & 4 \leq x < 5; \\ 0.95, & 5 \leq x < 6; \\ 1, & 6 \leq x \end{cases}$ Then $P(2 \leq X < 6)$ is (a) 0.61 (b) 0.76 (c) 0.56 (d) 0.78 Answer: b | CO-3 |
| | | The cdf of the rv X is as follows: $F(x) = \begin{cases} 0 & x < 0 \\ 0.06 & 0 \leq x < 1 \\ 0.19 & 1 \leq x < 2 \\ 0.39 & 2 \leq x < 3 \\ 0.67 & 3 \leq x \leq 4 \\ 0.92 & 4 \leq x < 5 \\ 0.95 & 5 \leq x < 6 \\ 1 & 6 \leq x \end{cases}$ Then $P(3 \leq X \leq 6)$ is (a) 0.61 (b) 0.33 (c) 0.56 (d) 0.78 Answer: a | CO-3 |
| | | The cdf of the rv X is as follows: $F(x) = \begin{cases} 0, & x < 0 \\ 0.06, & 0 \leq x < 1 \\ 0.19, & 1 \leq x < 2 \end{cases}$ | CO-3 |

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| | | $0.39, 2 \leq x < 3$ $0.67, 3 \leq x \leq 4$ $0.92, 4 \leq x < 5$ $0.95, 5 \leq x < 6$ $1, 6 \leq x$ Then $P(2 < X < 4)$ is (a) 0.53 (b) 0.83 (c) 0.48 (d) 0.28 Answer: d | |
| | | The cdf of the rv X is as follows: $F(x) = 0, x < 0;$ $0.06, 0 \leq x < 1;$ $0.19, 1 \leq x < 2$ $0.39, 2 \leq x < 3$ $0.67, 3 \leq x \leq 4$ $0.92, 4 \leq x < 5$ $0.95, 5 \leq x < 6$ $1, 6 \leq x$ Then $P(1 \leq X < 5)$ is (a) 0.61 (b) 0.33 (c) 0.86 (d) 0.76 Answer: c | CO-3 |
| Q.No:1(d) | | Consider two urns having some balls. Let first urn contains 3 white balls and 2 red balls and second urn contains 2 white and 4 red balls. One ball is drawn randomly then the probability that the drawn ball is white (a) $14/15$ (b) $7/15$ (c) $23/60$ (d) $1/2$ Answer: b | CO-4 |
| | | Consider two bags having some balls. Let first bag contains 3 blue balls and 6 green balls and second bag contains 6 blue and 3 green balls. One ball is drawn randomly then the probability that the drawn ball is green (a) $3/7$ (b) $2/9$ (c) $1/3$ (d) $1/2$ Answer: d | CO-4 |
| | | Consider two bags having some balls. Let first bag contains 3 blue balls and 2 green balls and second bag contains 2 blue and 4 green balls. One ball is drawn randomly then the probability that the drawn ball is green (a) $7/15$ | CO-4 |

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| | | (b) 2/5 (c) 8/15 (d) 32/30 Answer: c | | | | | | | |
| | | Consider two bags having some balls. Let first bag contains 4 blue balls and 3 green balls and second bag contains 6 blue and 1 green balls. One ball is drawn randomly then the probability that the drawn ball is green (a) 5/7 (b) 2/7 (c) 4/7 (d) 3/7 Answer: b | CO-4 | | | | | | |
| Q.No:1(e) | | If X has Binomial distribution with parameters n=15 and p=0.10 then E(X-1) and V(X+1) are respectively (a) 1.5, 2.35 (b) 0.5, 1.35 (c) 1, 0.95 (d) None of These Answer: b | CO-5 | | | | | | |
| | | If X has Binomial distribution with parameters n=20 and p=0.05 then E(X+2) and V(X+2) are respectively (a) 3, 0.95 (b) 3, 2.95 (c) 1, 0.95 (d) None of These Answer: a | CO-5 | | | | | | |
| | | Six specimens of Hastelloy C (nickelbasedsteel, investment cast) had the tensile strength recorded in the order obtained. <table border="1"> <tr> <td>77</td> <td>79</td> <td>78</td> <td>76</td> <td>75</td> <td>80</td> </tr> </table> Then the variance of this sample (a) 3.50 (b) 77.5 (c) 3.80 (d) 76.5 Answer: a | 77 | 79 | 78 | 76 | 75 | 80 | CO-5 |
| 77 | 79 | 78 | 76 | 75 | 80 | | | | |
| | | If X has Bernoulli distribution with p=0.05 then E(-2X+3) and V(-2X-2) are respectively (a) 2.90, 0.19 (b) 2.90, -2.10 (c) 0.20, 0.19 (d) None of These Answer: a | CO-5 | | | | | | |

SECTION-B(Answer Any One Question. Each Question carries 10 Marks)

Time: 30 Minutes
(1×10=10 Marks)

| Question No | Question | CO Mapping |
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| Group-1 | | |
| Q.No:2 | <p>An academic department with five faculty members— Anderson, Box, Cox, Cramer, and Fisher—must select two of its members to serve on a personnel review committee. Because the work will be time-consuming, no one is anxious to serve, so it is decided that the representative will be selected by putting the names on identical pieces of paper and then randomly selecting two.</p> <p>a. What is the probability that both Box and Cox will be selected?</p> <p>b. What is the probability that at least one of the two members whose name begins with C is selected?</p> <p>c. If the five faculty members have taught for 3, 6, 7, 10, and 14 years, respectively, at the university, what is the probability that the two chosen representatives have a total of at least 13 years' teaching experience there?</p> | CO-1 |
| Q.No:3 | <p>a. One box contains eight red balls and five green balls, and a second box contains six red balls and seven green balls. A ball is randomly chosen from the first box and placed in the second box. Then a ball is randomly selected from the second box and placed in the first box.</p> <p>i. What is the probability that a red ball is selected from the first box and a red ball is selected from the second box?</p> <p>ii. At the conclusion of the selection process, what is the probability that the numbers of red and green balls in the first box are identical to the numbers at the beginning?</p> <p>b. Suppose an individual is randomly selected from the population of all adult males living in India. Let A be the event that the selected individual is over 6 ft in height, and let B be the event that the selected individual is a professional basketball player. Which do you think is larger, $P(A B)$ or $P(B A)$? Why?</p> | CO-2 |
| Q.No:4 | <p>A chain of video stores sells three different brands of DVD players. Of its DVD player sales, 60% are brand 1 (the least expensive), 25% are brand 2, and 15% are brand 3. Each manufacturer offers a 1-year warranty on parts and labor. It is known that 25% of brand 1's DVD players require warranty repair work, whereas the corresponding percentages for brands 2 and 3 are 20% and 10%, respectively.</p> <p>i. What is the probability that a randomly selected purchaser has bought a brand 1 DVD player that will need repair while under warranty?</p> <p>ii. What is the probability that a randomly selected purchaser has a DVD player that will need repair while under warranty?</p> <p>iii. If a customer returns to the store with a DVD player that needs warranty repair work, what is the probability that it is a brand 1 DVD player? A brand 2 DVD player? A brand 3 DVD player?</p> | CO-3 |
| Group-2 | | |
| Q.No:5 | <p>a. What is binomial distribution with the random variable $X \sim \text{Bin}(n, p)$ and define the binomial pmf $b(x; n, p)$ of X where n=number of trials and p=probability of getting success.</p> <p>b. Find cdf value $B(10; 15, 0.4)$ and $B(5; 10, 0.65)$</p> <p>c. Find mean of the rv $X \sim \text{Bin}(n, p)$.</p> <p>d. Find variance of the rv $X \sim \text{Bin}(n, p)$.</p> <p>e. If Variance of X is 1.92, $n = 12$ then find the possible values of p?</p> | CO-4 |
| Q.No:6 | <p>The pmf of uniform distribution with random variable $X = \{1, 2, \dots, n\}$ is</p> $p(x; n) = P(X = x) = \frac{1}{n}, x = 1, 2, \dots, n.$ <p>a. Find the cdf of uniform distribution $F(x; n)$.</p> <p>b. Sketch the graph of $F(x; n)$ for $n = 5$.</p> <p>c. Calculate $P(5 \leq X < 13)$ for $n = 15$.</p> <p>d. Find mean of the rv X.</p> <p>e. Find variance of the rv X.</p> | CO-5 |
| Q.No:7 | <p>In any Bernoulli trial, the outcomes of the trial are success(S) and failure(F) given with their probabilities $P(S) = p$ and $P(F) = q$ respectively. The random</p> | CO-5 |

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| | <p>variable X has the geometric distribution that counts the position of getting the first success in the trial.</p> <ol style="list-style-type: none"> Find the pmf and cdf of geometric distribution $F(x; p)$. Sketch the graph of $F(x; p)$ for $x = 1, 2, 3, 4, 5$ and $p = 0.45$ Calculate $P(4 \leq X \leq 10)$ with $p = 0.45$. Find mean of X with arbitrary value of p. Find variance of X with arbitrary value of p. | |
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