



Spring Semester, 2022
B.Tech-II, Semester-(IV)
Tutorial Sheet-1
MA- 212

Full Marks: 10

Answer all of the following questions. All notations have their usual meanings.

1. Four universities—1, 2, 3, and 4 are participating in a holiday basketball tournament. In the first round, 1 will play 2 and 3 will play 4. Then the two winners will play for the championship, and the two losers will also play. One possible outcome can be denoted by 1324 (1 beats 2 and 3 beats 4 in first-round games, and then 1 beats 3 and 2 beats 4).
 - List all outcomes in S .
 - Let A denote the event that 1 wins the tournament. List outcomes in A .
 - Let B denote the event that 2 gets into the championship game. List outcomes in B .
 - What are the outcomes in $A \cup B$ and in $A \cap B$. What are the outcomes in A' ?
2. Suppose that vehicles taking a particular freeway exit can turn right (R), turn left (L), or go straight (S). Consider observing the direction for each of three successive vehicles.
 - List all outcomes in the event A that all three vehicles go in the same direction.
 - List all outcomes in the event B that all three vehicles take different directions.
 - List all outcomes in the event C that exactly two of the three vehicles turn right.
 - List all outcomes in the event D that exactly two vehicles go in the same direction.
 - List outcomes in D' , $C \cup D$ and $C \cap D$.
3. A certain system can experience three different types of defects. Let $A_i (i = 1, 2, 3)$ denote the event that the system has a defect of type i . Suppose that $P(A_1) = 0.12, P(A_2) = 0.07, P(A_3) = 0.05, P(A_1 \cup A_2) = 0.13, P(A_1 \cup A_3) = 0.14, P(A_2 \cup A_3) = 0.10, P(A_1 \cup A_2 \cup A_3) = 0.01$
 - What is the probability that the system does not have a type 1 defect?

- What is the probability that the system has both type 1 and type 2 defects?
 - What is the probability that the system has both type 1 and type 2 defects but not a type 3 defect?
 - What is the probability that the system has at most two of these defects?
4. Consider randomly selecting a single individual and having that person test drive 3 different vehicles. Define events A_1, A_2 , and A_3 by A_1 = likes vehicle #1, A_2 = likes vehicle #2 and A_3 = likes vehicle #3. Suppose that $P(A_1) = 0.55, P(A_2) = 0.65, P(A_3) = 0.70, P(A_1 \cup A_2) = 0.80, P(A_2 \cap A_3) = 0.40$ and $P(A_1 \cup A_2 \cup A_3) = 0.88$.
- What is the probability that the individual likes both vehicle #1 and vehicle #2?
 - Determine and interpret $P(A_2|A_3)$.
 - Are A_2 and A_3 independent events? Answer in two different ways.
 - If you learn that the individual did not like vehicle #1, what now is the probability that he/she liked at least one of the other two vehicles?