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*Introduction to probability and statistics for software Engineers (stat2071)*

Work sheet II. (Assignment to be submitted on final exam date Q2, Q5, Q7, Q8& Q11 10%)

1. Let *A, B*, and *C* be arbitrary events. Find expressions for the events that of *A, B, C*:

(a) None occurs.

(b) Only *A* occurs.

(c) Only one occurs.

(d) At least one occurs.

(e) *A* occurs and either *B* or *C* occurs but not both.

(f) *B* and *C* occur, but *A* does not occur.

(g) Two or more occur.

(h) At most two occur.

(i) All three occur.

1. A satellite can fail for many possible reasons, two of which are computer failure and engine failure. For a given mission, it is known that:

The probability of engine failure is 0.008.

The probability of computer failure is 0.001.

Given engine failure, the probability of satellite failure is 0.98.

Given computer failure, the probability of satellite failure is 0.45.

Given any other component failure, the probability of satellite failure is zero.

1. Determine the probability that a satellite fails.
2. Determine the probability that a satellite fails and is due to engine failure.
3. Assume that engines in different satellites perform independently. Given a satellite has failed as a result of engine failure, what is the probability that the same will happen to another satellite?
4. .Events *A* and *B* are mutually exclusive. Can they also be independent? Explain
5. Let and what is if;

(a) *A* and *B* are independent?

(b) *A* and *B* are mutually exclusive?

1. A machine part may be selected from any of three manufacturers with probabilities , .The probabilities that it will function properly during a specified period of time are 0.2, 0.3, and 0.4, respectively, for the three manufacturers. Determine the probability that a randomly chosen machine part will function properly for the specified time period.
2. Show that any random variable is uncorrelated with a constant**.**
3. The time, in minutes, required for a student to travel from home to a morning class is uniformly distributed between 20 and 25. If the student leaves home promptly at 7:38 a.m., what is the probability that the student will not be late for class at 8:00 a.m.?
4. Let

* 1. What must be the value of *k*?
  2. Determine the marginal pdfs of *X* and *Y*.
  3. Are *X* and *Y* statistically independent? Why?

1. A random variable *X* has the exponential distribution

Determine:

1. The value of a.
2. The mean and variance of *X*.
3. The mean and variance of *Y* (*X*/2) 1.
4. The diameter of an electronic cable, say *X*, is random, with pdf
5. What is the mean value of the diameter?
6. What is the mean value of the cross-sectional area,
7. The random pair has the joint distribution as follows

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| XY | (1,2) | (1,3) | (1,4) | (2,2) | (2,3) | (2,4) | (3,2) | (3,3) | (3,4) |
| P(X,Y) | 1/12 | 1/6 | 0 | 1/6 | 0 | 1/3 | 1/12 | 1/6 | 0 |

1. show that X and Y are dependent
2. Find the joint pmf of and