

**MAT 2377, Probability and statistics for engineers****Assignment 1**

*Deadline : Before 3 pm on Friday, January 30*

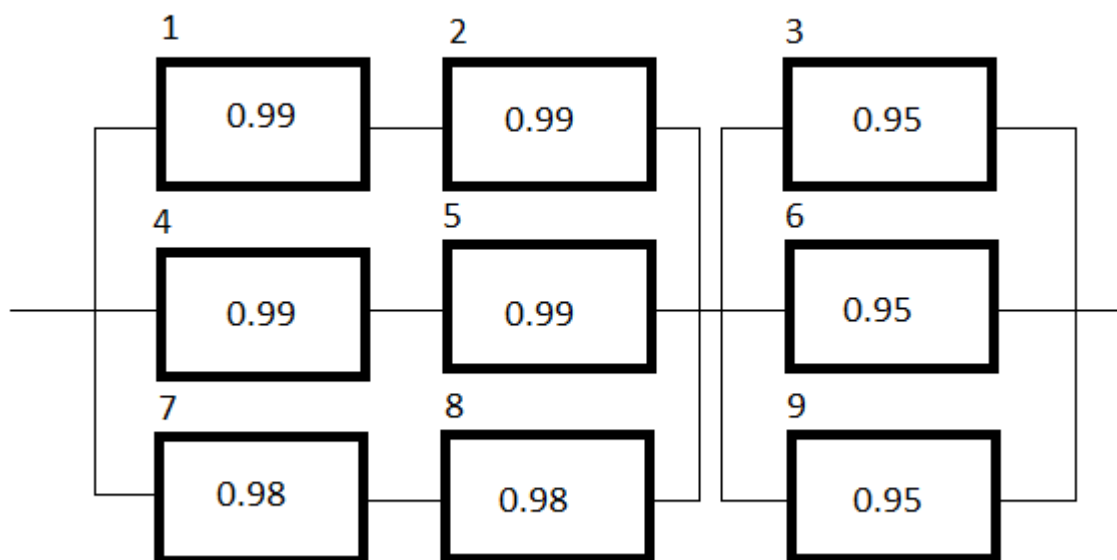
*Submit the assignment in the drop box at 585 King Edward*

*There are a total of 6 questions.*

Solve the following exercises with a TI-30, TI-34, Casio FX-260 or Casio FX-300 calculator.

1. Suppose that the probabilities are 0.85, 0.30 that, while under warranty, a new car will require repairs on the engine, and on the drive train, respectively. Suppose that 0.98 is the probability that, while under warranty, a new car will require repairs on the engine or the the drive train.
  - (a) What is the probability that a new car, while under warranty, will require at least one of theses types of repairs?
  - (b) What is the probability that a new car, while under warranty, will require both of theses types of repairs?
  - (c) What is the probability that a new car, while under warranty, will not require engine repair nor will it require repairs on the drive train?
  - (d) What is the probability that a new car, while under warranty, will require engine repairs but will not require repairs on the drive train?
  - (e) What is the probability that a new car, while under warranty, will not require engine repairs or will not require repairs to the drive train?
2. Printed circuit cards are placed in a functional test after being populated with semiconductor chips. A lot contains 45 cards, and 10 are selected without replacement for functional testing. If 5 cards among the 45 cards are defective, what is the probability that at least one defective card is in the sample?
3. A Dudley-brand lock is made of a 60-number dial (0, 1, 2, ..., 59). To unlock it, one must make the right sequence of 3 numbers in order. Turning the dial to clockwise to the first number, then counterclockwise (a full turn and then continuing) to the second number, then clockwise to the third number. There are conditions that a number cannot be used twice in a row, and the next number cannot be one of the 2 immediate neighbours (one to the left, one to the right). How many possible different arrangements are there for a Dudley lock? (For example 59, 1, 59 is a possible arrangement.)
4. A manufacturing operation consists of 10 operations. However, the five machining operations must be completed before any of the remaining five assembly operations can begin. Within each set of five, operations can be completed in any order. How many different production sequences are possible?

5. The following circuit is operational only if there is a path of functional devices from left to right. On each device we displayed its reliability, that is the probability that it is functional. Assume that devices are functional independently of each other. What is the probability that the circuit is operational?



6. Strands of copper wire from a manufacturer are analyzed for strength and conductivity. The results from 104 strands are as follows:

	strength	
	high	low
high conductivity	84	10
low conductivity	6	4

We select one strand at random among these 104 strands and define the events  $A$  = “high strength” and  $B$  = “low conductivity”.

- What is the probability that the selected strand has high strength?
- We know that the selected strand has low conductivity. What is the probability that it will have high strength?
- Are the events  $A$  and  $B$  independent?
- Are the events  $A$  and  $B$  mutually exclusive?