MAT 2377 A (Winter 2017)
Prof : Rachid Bentoumi

Assignment 1

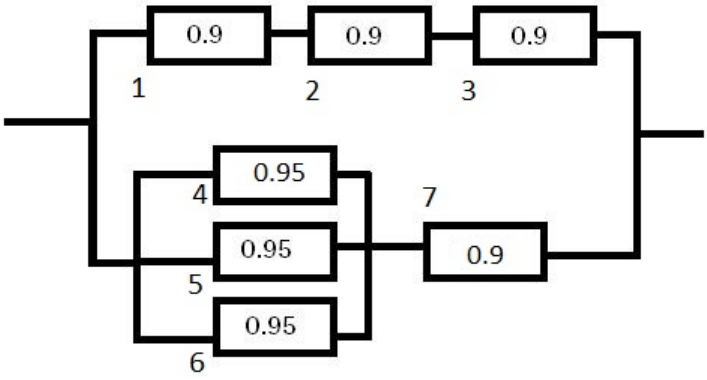
Deadline : Please submit in the drop box at 585 King Edward before 7 pm on Thursday, January 26, 2017
There are 6 questions

Please solve the following problems using a calculator permitted by the Faculty of Science (TI30, TI34, Casio fx-260 and Casio fx-300) :

1. If the probabilities are 0.85, 0.37, and 0.25 that, while under warranty, a new car will require repairs on the engine, drive train, or both.
   (a) What is the probability that a car will require at least one of the types of repairs under warranty ?
   (b) What is the probability that a car will not require engine repairs under warranty ?
   (c) What is the probability that a car will not require engine repairs under warranty or will not require drive train repairs under warranty ?
2. Strands of copper wire from a manufacturer are analyzed for strength and conductivity. The results from 98 strands are as follows :

	strength		
	high	low	Total
high conductivity	73	5	78
low conductivity	16	4	20
Total	89	9	98

   (a) If a strand is randomly selected, what is the probability that its conductivity is high and its strength is high ?
   (b) If a strand is randomly selected, what is the probability that its conductivity is low or the strength is low ?
   (c) Given that a randomly selected strand has low conductivity, what is the probability that it will have low strength ?
   (d) Consider the event that a strand has low conductivity and the event that the strand has a low strength. Are these events mutually exclusive ?
   (e) Consider the event that a strand has low conductivity and the event that the strand has a low strength. Does the data support the conclusion that these two events are independent ?
3. Refer to Question 2. Suppose that we randomly select 5 of the 98 strands of wire, without replacement.
   (a) What is the probability that all five have high strength ?
   (b) What is the probability that at most one will have high strength ?
4. A large industrial firm uses three local motels to provide overnight accommodations for its clients. From past experience it is known that 21% of the clients are assigned rooms at the Ramada Inn, 49% at the Sheraton, and 30% at the Lakeview Motor Lodge. If the plumbing is faulty in 4% of the rooms at the Ramada Inn, in 3.5% of the rooms at the Sheraton, and in 7.5% of the rooms at the Lakeview Motor Lodge, what is the probability that
   (a) a client will be assigned a room with faulty plumbing ?
   (b) a person with a room having faulty plumbing was assigned accommodations at the Lakeview Motor Lodge ?
5. The following circuit operates only if there is a path of functional devices from left to right. The probability that each device functions is shown on the graph. Assume that devices fail independently. What is the probability that the circuit operates ?



6. Here are two counting problems to solve.

   (a) A Dudley-brand lock is made of a 60-number dial $(0, 1, 2, \cdots, 59)$. To unlock it, one must make the right sequence of 3 numbers in order, turning the dial to the right, then to the left all around once, then to the right. However, 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) either. How many possible number sequences are there ? (For example 15, 48, 50 is a possible combination. 15, 16, 40 is **not** a possible combination, since 15 is immediately followed by an immediate neighbour. 15, 15, 40 is **not** a possible combination, since 15 is immediately followed by itself. However, 15, 40, 15 is a possible combination. Careful : the immediate neighbours of 0 are 1 and 59.)

   (b) An elementary school teacher with a box of 24 candies with 6 different flavours, 4 of each kind, distributes one candy at random to each of her 24 students. How many different ways are there to distribute these 6 flavours of candies amongst the 24 children ?