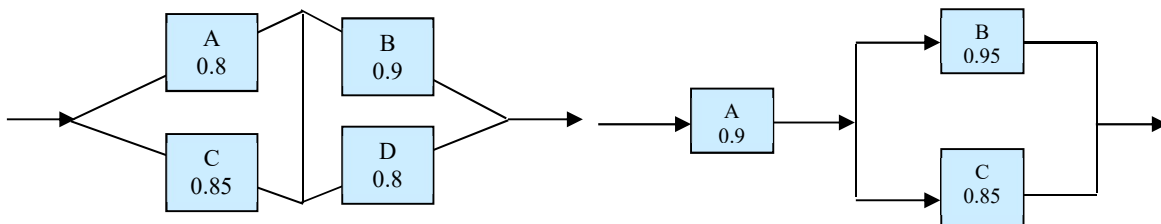


Birzeit University
 Faculty of Engineering
 Department of Electrical Engineering
 Engineering Probability and Statistics ENEE 331
 Problem Set (1)
Fundamental Concepts of Probability

- 1) Three people, A, B, and C, are running for the same office, and we assume that one and only one of them wins. Suppose that A and B have the same chance of winning, but that C has only 1/2 the chance of A or B. Let E be the event that either A or C wins. Find $P(E)$?
- 2) The student body is re-electing the class President, Vice-President, Treasurer, and Secretary from a group of 28 students consisting of 10 seniors, 8 juniors, 6 sophomores, and 4 freshmen. This time each class must be represented. What is the probability of electing one officer from each class?
- 3) Suppose you are taking a multiple-choice test with c choices for each question. In answering a question on a test, the probability that you know the answer is p . If you don't know the answer, you choose one at random. What is the probability that you knew the answer to a question, given that you answered it correctly?
- 4) A sample space consists of three events, A, B and C. If $P(A^c) = 0.5$, and $P(A \cap B) = 0.25$, $P(B \cup C) = 0.75$. The pair of events (A and B), (B and C) are independent. Events A and C are mutually exclusive. Find the followings:
 - a. Probability that exactly one event will occur.
 - b. $P(B/A)$
- 5) Consider the following systems made up of independent components. The probability that each component functions is indicated in the figures.
 - a. Find the probability that the systems work properly (system reliability).
 - b. Is it possible to increase the reliability up to 99.5% for the system in (b) by adding more components in the parallel connection?



- 6) In a factory of Plastic tow machines produce 1000 pieces, the first produce 70% of these pieces, its produce 350 cups, and 250 plates, the second machine produce 150 cups and 120 bowls and the rest is plates. If one of these tow machines product is selected at random, find the probability that

Let M_1 :First Machine; M_2 :Second Machine; C :Cups, L :Plates;
 B:Bowls.

 - a. The product is plate?
 - b. The product is either cups, plates, either bowls?
 - c. The product is produced by the first machine if it was cups?

- 7) A manufacturing firm employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at varying times. In fact, plans 1, 2, and 3 are used for 30%, 20%, and 50% of the products, respectively. The defect rate is different for the three procedures as follows: $P(D | P1) = 0.01$, $P(D | P2) = 0.03$, $P(D | P3) = 0.02$, where $P(D | Pj)$ is the probability of a defective product, given plan j . If a random product was observed and found to be defective, which plan was most likely used and thus responsible?
- 8) A box contains colored balls: 5 Red balls and 7 Green balls. Suppose that three balls are drawn from this box.
- If the three balls are drawn one after another without replacement, what is the probability that the colors observed will be Red, Green in this order?
 - If the three balls are drawn one after another with replacement, what is the probability that all three of the selected balls will be of the same color?
 - If the three balls are drawn simultaneously from this urn (thus without replacement), what is the probability that the selected balls will all be of the same colors?
- 9) For a storm-sewer system, estimates of annual maximum flow rates (AMFR) and their likelihood of occurrence [assuming that a maximum of 12 cubic feet per second, cfs, is possible] are given as:
- | | |
|--|--------------|
| Event A: ($5 \leq \text{AMFR} \leq 10$ cfs) | $P(A)$ |
| Event B: ($8 \leq \text{AMFR} \leq 12$ cfs) | $P(B) = 0.6$ |
| Event C= $A \cup B$ | $P(C) = 0.7$ |
- Determine $P(8 \leq \text{AMFR} \leq 10 \text{ cfs})$, the probability that AMFR is between 8 and 10 cfs.