UNIVERSITY OF PITTSBURGH
Department of Electrical and Computer Engineering
ECE 2521 Analysis of Stochastic Processes

# Problem Set 2 (Fall 2021)

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Assigned: Sept 15
Due: Sept 22
References: Secs. 2.3, 2.4, 2.5, and 2.6 (Leon-Garcia )

**Problem 2.1 :** Text problem 2.43 (page 86).

**Problem 2.2 :** Text problem 2.46 (page 86).

**Problem 2.3 :** Text problem 2.79 (page 89).

**Problem 2.4 :** Text problem 2.81 (page 89).

**Problem 2.5 :** Text problem 2.87 (page 90).

**Problem 2.6 :** Text problem 2.100 (page 91 ).

**Problem 2.7 :** Text problem 2.102 (page 91 ).

**Problem 2.8 : :** Draw the top 8 cards from a well-shuffled standard 52-card deck. Find the probability that

(a) The 8 cards include exactly 4 queens.
(b) The 8 cards include exactly 2 kings.
(c) The 8 cards include exactly 4 queens or exactly 2 kings or both.

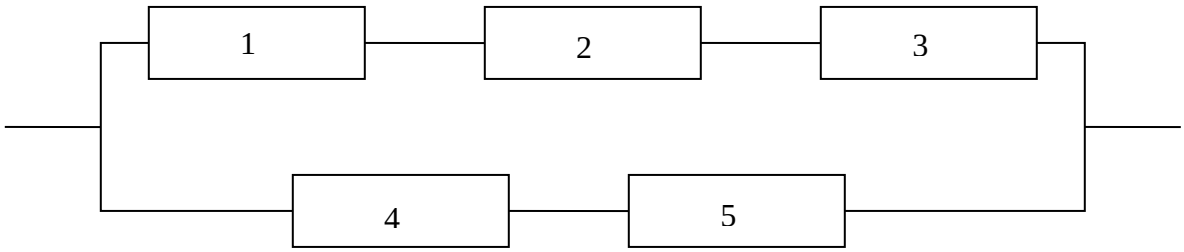
**Problem 2.9 :**. Twenty distinct cars park in the same parking lot everyday. Ten of these cars are US-made, while the other ten are foreign-made. This parking lot has exactly twenty spaces, and all are in a row. However, the drivers have different schedules on any given day, so the position any car might take on a certain day is random.

(a) In how may different ways can the cars line-up?
(b) What is the probability that on a given day, the cars will park in such a way that they are of alternate makes?

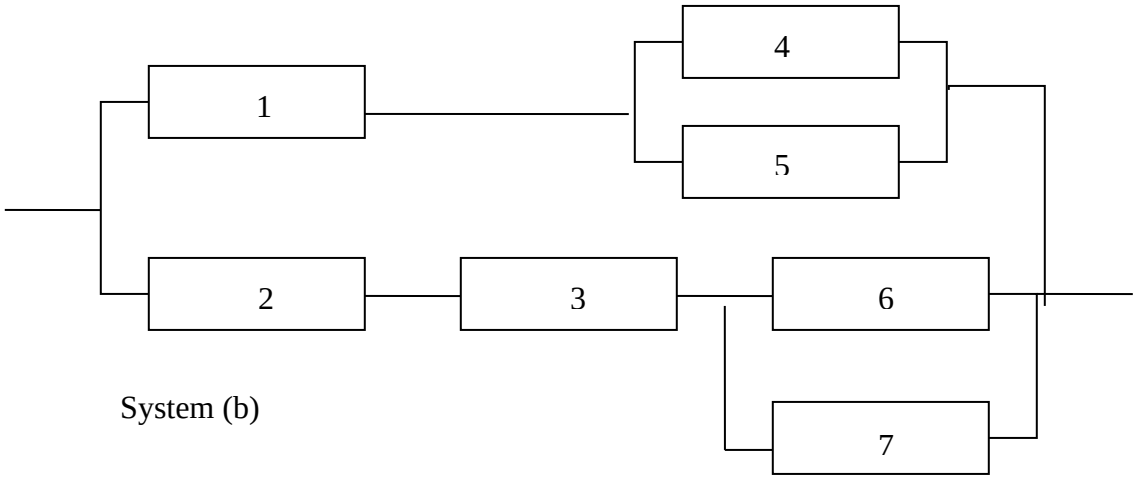
**Problem 2.10 :** We are given three coins: one has heads in both faces, the second has tails in both faces, and the third has a head in one face and a tail in the other. We choose a coin at random (with equal probabilities), toss it, and the result is heads. What is the probability that the opposite face is tails?

**Problem 2.11:** Two communication systems (shown below) are composed from several links, where, for proper operation, a connection must be available between two end points of each

system. For a link to work properly, it must provide a connection across its end points. The links are assumed to fail independently of each other. Each link is numbered with $i$, and we assume that the probability that link $i$ fails is equal to $q_i$. Find the probability of failure of each system, where $q_1 = 0.1,\ q_2 = q_3 = 0.05,\ q_4 = q_5 = 0.15,\ q_6 = q_7 = 0.2$.




System (a)




System (b)