FIRST MIDTERM EXAM

STA 110A
Brani Vidakovic
Monday 10/3/1994.

Name _____

ID number _____

Notes:

1. This is an open book and open notes exam.

2. You must show your work and explain your answer in order to receive credit.

3. The exam carries 100 points.

4. The points assigned to each problem are indicated at the beginning of that problem. Use them to plan your time. You have 75 minutes to finish.

5. The exam has 6 problems.

Problem	1	2	3	4	5	6	Total
Score	/15	/20	/15	/20	/15	/15	

1.[15pts] The unhappy outcome of uninformed mushroom-picking is poisoning. In many cases such poisoning is due to ignorance or a superficial approach to identification. The most dangerous fungi are Death Cap (*Amanita Phaloides*) and two species akin to it *Amanita Verna* and Destroying Angel (*Amanita Virosa*). These three toadstools cause the majority of fatal poisoning.

One of the keys for mushroom identification is the spore deposit. Spores of *Amanita Phaloides* are colorless, almost spherical, and smooth. Measurements in $m\mu$ of 28 spores are given below:

9.2	8.8	9.1	10.1
8.5	8.4	9.3	8.7
9.7	9.9	8.4	8.6
8.0	9.5	8.8	8.1
8.3	9.0	8.2	8.6
9.0	8.7	9.1	9.2
7.9	8.6	9.0	9.1

Find the **five number summary** for the spore measurements data.

2. [20 pts] Robin Hood hits the target with the probability 0.8 while the Sheriff of Nottingham hits the target with the probability 0.6. They shoot 3 arrows each and all shots are independent of each other.

(a) What event is more likely:

A: Sheriff hits the target at least 2 times; or **B:** Robin hits the target at most 2 times.

(b) They shoot in the following order:**S R S R S R.** What is the probability that the Sheriff scores before Robin. (Remember Mario and Scuba).

3. [15 pts] Suppose that each of the switches S_i in the following circuit is closed with probability p_i and open with probability $q_i = 1 - p_i$. Calculate the probability that a current will flow through the circuit, assuming that the switches act independently.

p_1	p_2	p_3	p_4	p_5
0.4		0.6	0.8	

q_1	q_2	q_3	q_4	q_5
	0.3			0.5

4.[20pt] In a small village in Transylvania 15% of the population are vampires, 20% are ghosts, and 65% are ordinary people. Vampires never tell the truth, ghosts tell the truth 37% of the time, and ordinary people tell the truth 95% of the time. It is impossible to tell apart vampires, ghosts and ordinary people by the way they look (between 6:00am and 11:59:59pm). You are introduced to a gentleman from the village.

(a) What is the probability that he did not give you his real name?

(b) Just at 11:59pm you realize that the gentleman lied about his name. What is the probability that your companion is a vampire or ghost?

Choose only one:

5.[15pt] Construct (give the probability distribution) an example of a discrete random variable that satisfies the following requirements:
- it takes only three different values with positive probabilities;
- it has a mean equal to 0;
- it has a variance equal to 2.

or 5.[15pt] The Sheriff of Nottingham is taking some badly needed archery practice. He shoots at the target 3 times and has a probability of hitting the target of 0.6 with each shot. The shots are independent. Describe the random variable: X=number of hits in 3 trials.

6.[15 pt] The size of mushroom caps varies. While many species of *Marasmius* and *Collybia* are only 12-20 mm (1/2-3/4 in) in diameter, some fungi are nearly 200mm (8 in) across. The cap diameter of parasol mushroom (*Macrolepiota Procera*) is a Normal random variable with parameters $\mu = 230mm$ and $\sigma = 25mm$.

(a) What proportion of parasol caps has a diameter between 200 and 250 mm.

(b) 5% of parasol caps are larger than x_0 in diameter. Find x_0.