**316 Midterm Exam, Summer 2013**

**Instructor: Amir K. Khandani**

**Time: 1.5 hours (Attempt all questions)**

1-A box contains 20 balls, which are blue, white, green and black. Assume that there exist exactly five balls of each color. 4 balls are withdrawn randomly.

* + 1. What is the probability that they all have distinct colors? (10 points)
    2. What is the probability that two of the balls are white and two of them are black? (10 points)

1. In a community, voters are classified as Independents, Liberals and Conservatives in the proportions 50:20:30. In a recent local election, 0.6 of Independents, 0.3 of Liberals and 0.4 of Conservatives have voted.
   * 1. Find the probability that a randomly selected person has voted? (10 points)
     2. Given that a randomly selected person has voted, what is the probability that he/she is a Liberal? (10 points)
2. The voltage of an electric device is assumed to be a normal random variable with mean 20 V and variance 4 V.
   * 1. What is the probability that the voltage is less than 18 V? (10 points)
     2. Assume that a device with voltage  consumes  watts of power. What is the mean of the power consumed by one device? (10 points)

Note that



1. In a batch of manufactured units, 2% of the units have the wrong weight (and perhaps also the wrong color), 5% have the wrong color (and perhaps also the wrong weight), and 1% have both the wrong weight and the wrong color.
   * 1. A unit is taken at random from the batch. What is the probability that the unit is defective in at least one of the two respects? (10 points)
     2. What is the probability mass function of the number of units selected to find the first non-defective item? (10 points)
2. In a batch of 50 units there are 5 defectives. A unit is selected at random, and thereafter one more from the remaining ones.
   * 1. Find the probability that both are defective. (10 points)
     2. Find the probability than both units are non-defective. (10 points)