Statistics 100  
Midterm II

Instructions: 1. **WORK ALL PROBLEMS.** Please, give details and explanations and **SHOW ALL YOUR WORK** so that partial credits can be given.
2. You may use two pages of notes, tables and a calculator.

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**Points**

1. Meteorologists classify storms as either single or multiple peaks. The total number of lightning flashes was recorded for seven single-peak and five multiple-peak storms, resulting in the following data:
   - Single-peak: 101 53 47 40 60 66 75
   - Multiple-peak: 227 201 245 239 208
   Does the data suggest that the true mean number of lightning flashes differ for the two types of storms? State the null and alternative hypotheses and test at 0.01 level.
   (20)

2. Two drugs A and B are compared for treatment of duodenal ulcer. In a random sample of 200 patients treated using drug A, 146 observed favorable results. In another random sample 200 patients treated by drug B, 165 observed favorable results.
   - a. State the null and alternative hypotheses?
   - b. Test your stated hypothesis at $\alpha = 0.05$ level and explain the results.
   - c. What is the p-value? Explain the meaning of this p-value.
   (5) (15) (5)

3. The lead content of measurements taken at six Napa Valley wineries in two consecutive years are:
   - First Year: 0.08, 0.22, 0.34, 0.31, 0.39, 0.25
   - Second Year: 0.06, 0.25, 0.30, 0.35, 0.32, 0.20
   Are these wineries improved in terms of reducing lead levels?
   - a. State the null and alternative hypotheses.
   - b. Assume the distribution of lead levels is not normal. Test your hypothesis at 0.05 level of significance.
   - c. Find the p-value.
   (5) (15) (5)

4. The American Dental Association is examining the effectiveness of two types of medication for reducing pain during dental work. A pain index is used to measure pain felt by the patients. The sample information is given below:
   - Sample Size  | Sample mean | Sample Standard deviation
   - Medication I  | 18          | 6.1  | 1.4
   - Medication II | 20          | 8.7  | 2.9
   Is there a difference between the mean pain indices of these two medications?
   - a. Write down the null an alternative hypotheses.
   - b. Test the hypothesis at 0.01 level of significance.
   - c. Find the p-value.
   - d. Construct a 99% confidence interval for the difference between the two means and explain its meaning. Does this confidence interval support the null hypothesis? Explain your answer.
   (5) (10) (5) (10)