Math 663-102, Spring 2012

Mid-Term Exam

Name:_____

Student ID:_____

March, 26. *Please show the complete solution (with all steps) to each problem to receive perfect score*!

I pledge I have not violated the NJIT Honor Code_____

1. a. – d. A sample was taken of 20 salaries of employees in a large health insurance company. The following are the annual salaries (in thousands of dollars). For convenience, the data have been ordered.

| 28 | 31 | 34 | 35 | 37 | 41 | 42 | 42 | 42 | 47 |
| 49 | 51 | 52 | 52 | 60 | 61 | 67 | 72 | 75 | 77 |

a. What is the median salary of the 20 employees in dollars? (5 points)

b. What is the first quartile of the 20 salaries in dollars? (5 points)

c. What is the interquartile range of the 20 salaries in dollars? (5 points)

d. Suppose each employee in the company receives a $3000 raise for next year (each employee's salary is increased by $3000). For each of the following summary measures, indicate how it would change after the raise. (5 points)

    A) The median salary in dollars.

    B) The interquartile range of the salaries in dollars.

    C) The standard deviation of the salaries in dollars.

2. a. – c. The following data were collected from the 2003 administrative records at a local community center:

Age	Diabetes	Asthma	Arthritis	Cardiac	Total
		Primary Diagnosis			
30 - 39	27	56	20	30	133
40 - 49	32	32	25	24	113
50 – 59	30	14	43	43	130
60+	29	7	65	41	142
Total	118	109	153	138	518

   a. Are the variables Age and Primary Diagnosis independent of each other?   (8 points)

   b. What proportion of 60+ years of age has either Diabetes or Cardiac as their primary diagnosis?   (7 points)

   c. What proportion of patients is of age 30 - 39 or has Asthma as their primary diagnosis?
      (Please see problem 6, page 138 and 7, page 139)   (5 points)

3. A longitudinal study is conducted requiring patients to follow up with research associates every month for assessments. The probability a patient fails to follow up in a given month is 12%. A pilot study is conducted to assess feasibility involving 15 patients. What is the probability at least two patients will fail to follow up in the first month? What model assumptions are necessary to validate this probability computation?
(Please see problem 16, page 142)   (15 points)

4. a. –b. A dispensing machine is set to produce 1-pound lots of a particular compound. The machine is fairly accurate, producing mean weight of lots equal to 1.0 pounds with a standard deviation of 0.12 pounds. Thirty two lots are randomly selected:

      a. Find the probability that the mean weight is less than 0.96 pound.

      b. Find the mean weight in pound whose value is exceeded by only 7% of the mean weights.   (Please see problem 3, page 168) (15 points)

5. We wish to run the following test H_0: $\mu = 100$, H_1: $\mu < 100$ at $\alpha = 0.05$. If $\sigma = 10$, how large a sample would be required so that the power $= 0.80$ when $\mu = 105$?   (10 points)

6. In a study comparing two competing medications for asthma, 16 subjects are randomized to one of the competing treatments. The data shown reflect asthma symptom scores for patients assigned to each treatment. Higher scores are indicative of worse asthma symptoms. Test if there is a significant difference in mean asthma symptom scores between medications. Use the appropriate (with statistical justification) test to determine a significant difference in the mean asthma symptom scores and throughout use $\alpha = 0.05$. What assumptions if any are needed to solve this problem?   (20 points)

| Treatment A | 55 | 61 | 81 | 65 | 75 | 78 | 68 | 70 |
| Treatment B | 81 | 82 | 86 | 89 | 77 | 81 | 91 | 76 |