Name: ________________________ **Section: <u>MAT098/181C-</u>**

MAT098/181C EXAM #4 (FORM C)

A scientific calculator is permitted. ***Cellphones may not be used as calculators and must be off or on vibrate during the exam****. Show all work on the test or on the work*

1. A random sample of 200 persons from a labor force of a large city are interviewed and 22 of them are found to be unemployed. Give a 95% confidence interval for the proportion of unemployment in that city. (*20 pts*)

   a) Determine whether the conditions are met.

   b) Construct the 95% confidence interval.

2. A manager of a large production facility wants to determine the average time required to assemble furniture. A random sample of the time to produce 50 assembled furniture pieces gave a mean of 20.4 minutes and a population standard deviation of 3.7 minutes. Construct a 95% confidence interval for the average time it takes to produce each piece of assembled furniture. Round final answer to one decimal place. (*20 pts*)

3. How many BHCC students must be randomly selected to estimate the mean amount of time students spend on social media per day? We want 99% confident that the sample mean is within 75minutes of the population mean, and the population standard deviation is known to be 200 minutes. (*12 pts)*

For the problems (4) and (5), please state:

1) **Null, Alternate Hypothesis, type of test & level of significance**
2) **Check the conditions.**
3) **Compute the sample test statistic, draw a picture and find the P-value.**
4) **State the conclusion about the Null Hypothesis.**
5) **Interpret the conclusion.**

4. In a recent American College Student Survey, 92% of female college students rated the social network site Facebook as "cool." Assume that the survey was based on a random sample of 500 students. A marketing executive at Facebook wants to advertise the site with the slogan "More than 88% of female college students think Facebook is cool." Use a 0.05 significance level to test the claim that more than 88% of female college students think that Facebook is cool. (*24 pts)*

For the problems (4) and (5), please state:

1) **Null, Alternate Hypothesis, type of test & level of significance**
2) **Check the conditions.**
3) **Compute the sample test statistic, draw a picture and find the P-value.**
4) **State the conclusion about the Null Hypothesis.**
5) **Interpret the conclusion.**

5. In a recent medical study, 76 subjects were placed on a low-fat diet. After 12 months, their sample mean weight loss was 2.2 kilograms, with a standard deviation of 6.1 kilograms. Use a 0.05 significance level to test the claim that the average weight loss is not 0 (zero). (*24 pts)*

(EXTRA CREDIT)

1. The mean number of absences a student has per semester is believed to be about 4 days. Faculty in a university does not believe this figure. They randomly survey 9 students. The number of absences they took for the last semester are as follows:

   2, 0, 1, 5, 2, 4, 3, 5, 7

   Let $x =$ the number of absences a student had for the last semester. Assume that x follows a normal distribution. Should the faculty team believe that the mean number is 4 days? Round to one decimal place. (*5 pts*)

2. A company that manufactures steel wires guarantees that the mean breaking strength (in kilonewtons) of the wires is greater than 50. They measure the strengths for a sample of wires and test

   H_0: $\mu = 50$ versus H_1: $\mu > 50$.

If a Type I error is made, what conclusion will be drawn regarding the mean breaking strength? (*5 pts*)

Confidence Interval for Population Parameters

<table>
<tr><th>Concept</th><th>Population Proportion p</th><th colspan="2">Population Mean μ</th></tr>
<tr><td>confidence interval formula</td><td>$\hat{p} \pm Z_c \cdot \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$</td><td>$\sigma$ known
$\bar{x} \pm Z_c \cdot \frac{\sigma}{\sqrt{n}}$</td><td>$\sigma$ unknown
$\text{df} = n - 1$
$\bar{x} \pm T_c \cdot \frac{s}{\sqrt{n}}$</td></tr>
<tr><td rowspan="2">sample size formula</td><td>$\hat{p} = \frac{x}{n}$ known
$n = \hat{p} \cdot \hat{q} \cdot \left(\frac{Z_c}{E}\right)^2$</td><td colspan="2" rowspan="2">$n = \left(\frac{Z_c \cdot \sigma}{E}\right)^2$</td></tr>
<tr><td>$\hat{p}$ unknown
$n = \frac{1}{4} \cdot \left(\frac{Z_c}{E}\right)^2$</td></tr>
</table>

- 90% confidence interval: $Z_c \approx 1.645$
- 95% confidence interval: $Z_c \approx 1.960$
- 99% confidence interval: $Z_c \approx 2.576$

Hypothesis Testing

<table>
<tr><th>Concept</th><th>Population Proportion p</th><th colspan="2">Population Mean μ</th></tr>
<tr><td>test statistics</td><td>$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$</td><td>$\sigma$ known
$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$</td><td>$\sigma$ unknown
$\text{df} = n - 1$
$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$</td></tr>
</table>

- If the P-value $< \alpha$, we reject the null hypothesis.
- If the P-value $\geq \alpha$, we fail to reject the null hypothesis.