Kingdom of Saudi Arabia
Ministry of Higher Education
Saudi Electronic University

المملكة العربية السعودية
وزارة التعليم العالي
الجامعة السعودية الالكترونية

Student Full Name:______________________________________ .

Student ID:____ .

CRN No:____ .

Branch: ____.

STATISTICS (STAT-101)

Total Points

True/False	____/5
MCQ	____/5
Short Answer	____/15
Total	____/25

Good Luck

STATISTICS (STAT-101)

Marks- 25

Answer all the Questions on the same question paper.

Section-I

***State whether the following statements are True or False.** (5 marks, 1 Mark Each)*

1. If P-value less then the significance level α , fail to reject null hypothesis . False
2. A Type I error is rejecting a true null hypothesis. True
3. The Student t distribution when σ is not known and either the population is normally distributed or $n > 30$, conditions is satisfied. True
4. If we have more than 10 matched pairs of sample data, we can consider the sample to be large and there is no need to check for normality. False
5. A claim that two population proportions are equal, each of the two samples must satisfy the requirement that $np \geq 5$ and $nq \geq 5$. True

Section-II

(Multiple Choice Questions) (5 marks, 1 Mark Each)

1. Consider the claim that the mean weight of airline passengers (including carry-on baggage) is at most 195 lb expressed as symbolic form:

   A. $\mu \leq 195$ lb.
   B. $\mu > 195$ lb.
   C. $\mu = 195$ lb.
   D. $\mu < 195$ lb.

2. Correct characterize a null hypothesis H_0 and alternative hypothesis H_1 test as two-tailed :

A. H_0: = , H_1: ≠

B. H_0: = , H_1: >

C. H_0: = , H_1: <

D. H_0: = , H_1: =

3. Which statement is incorrect?

A. The null hypothesis contains the equality sign.

B. When a false null hypothesis is not rejected, a Type II error has occurred.

C. If the null hypothesis is rejected, it is concluded that the alternative hypothesis is true.

D. If we fail to reject the null hypothesis, then it is proven that null hypothesis is true.

4. Sample sizes $n_1 = 100$, $n_2 = 100$ and numbers $x_1 = 39$, $x_2 = 41$ of successes to find the pooled estimate $\bar{p}$.

A. 0.400

B. 0.800

C. 0.360

D. 0.440

5. Which statement is incorrect?

A. F-distribution for two normally distributed populations with equal variance.

B. F-distribution can be negative.

C. The F-distribution is not symmetric.

D. F-distribution depends on the two different degree of freedom.

Part-II (Multiple Choice Questions) (5 marks, 1 Mark Each)

MCQ	1	2	3	4	5
Answers					

Section –III

Answer the following Essay Type Questions (15 marks, 5 Mark Each)

1. The overtime rule in the national football league report that among 414 football games won in overtime, 235 were won by the team that won the coin toss at the beginning of overtime. Using a 0.05 significance level, test the claim that the coin toss is fair in the sense that neither team has an advantage by winning it.

Solution. Let H_0 : P = 0.5 null hypothesis original claim that the coin toss is fair in the sense that neither.

H_1 : P ≠ 0.5 Alternative hypothesis original claim that the coin toss is not fair in the sense that neither.

Test statistic:

$$Z = \frac{\bar{p} - p}{\sqrt{pq}/n} = \frac{\frac{235}{414} - 0.5}{\sqrt{(0.5 \times 0.5)/414}} = 2.75$$

Z = 2.75

Critical value z = 1.96 and p- value = 0.0060

With the critical value method check – this is a two – tailed test, we find that the critical values of z = - 1.96 and z = 1.96 are at the boundaries of the critical z = 2.75 region. Since the test statistic fall within the critical region, we reject the null hypothesis.

Now check the p – value method – this is a two failed test, with a test statistic of z = 2.75, the p – value is twice the area to the right of z = 2.75.

Referring to Table A- 2, Left of z = 2.75 is 0.9970, so the area to the right of z is 1 – 0.9970 = 0.0030.

The p – value twice of right of z is 0.0060

Because the p – value 0.0060 is smaller than the significance level of 0.05, we reject the null hypothesis.

There is sufficient evidence to warrant rejection of the claim that the coin toss is fair in the sense that neither team has on advantage by winning it the coin toss rule does not appear to be fair.

2. Listed below are the heights(inches) for the simple random sample of supermodels Lima, Bundchen, Ebanks, Iman, Rubik, Kurkova, Kerr, Kroes, and Swanepoel. Use a 0.01 significance level to test the claim that supermodels have heights with a mean that a greater than the mean height of 63.8 in. for women in the general population. Given that there are only 10 heights represented, can we really conclude that supermodels are taller than the typical woman?

   70 71 69.25 68.5 69 70 71 70 70 69.5

Solution. The sample data meet the loose requirement of having a normal distribution,

H_0 : μ = 63.8 in null hypothesis, height of supermodel.

H_1 : μ > 63.8 in alternatives hypothesis, height of supermodel .

Because the claim is modal about the population mean $\mu_{\bar{x}}$, the sample statistic most relevant to this test is the sample mean $\bar{x}$. We use test statistic t – distribution

n = 10, $\bar{x}$ = 69.83, s = 0.7997

$$t = \frac{\bar{x} - \mu_{\bar{x}}}{s/\sqrt{n}}$$

$$= \frac{69.83 - 63.8}{0.7997/\sqrt{10}}$$

$$t = 23.842$$

critical value t = 2.821 since test statistic is fall in critical region, reject H_0. There the sufficient evidence to support the claim that supermodels have height with a mean that is greater than the mean height of 63.8 in for women in the general population. We can typical that super models are taller than typical woman.

3. The table show the number satisfied in their work in a sample of working adults. With a college education and in a sample of working adults without a college education. Do the data provide sufficient evidence that a greater proportion of those with a college education are satisfied in their work? Use a significance level of α = 0.05 to test the claim that $p_1 < p_2$.

	college education	**no college education**
No. satisfied in their work	**12**	**27**
No. in sample	**46**	**43**

Solution: H_0 : $p_1 = p_2$ (original claim)

H_1 : $p_1 < p_2$,

The significance level is α = 0.05

We use the normal distribution as an approximation to the bionomial distribution.

Estimate the common value of p_1 and p_2 ,

$$\bar{p} = \frac{x1+x2}{n1+n2} = \frac{12+27}{46+43} = 0.438202$$

Then $\bar{q}$ = 1- 0.438202= 0.561798.

test statistic is: $z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\frac{\bar{p}\bar{q}}{n_1} + \frac{\bar{p}\bar{q}}{n_2}}}$

$$= \frac{\left(\frac{12}{46} - \frac{27}{43}\right) - 0}{\sqrt{\left(\frac{(0.438202)(0.561798)}{46}\right) + \left(\frac{(0.438202)(0.561798)}{43}\right)}}$$

$= -3.49$

For the critical values in this left – tailed test by table A – 2 for the test statistics $z = -3.49$, area is 0.0002 from the left tail. So the p-value is 0.0002.
Because the p-value is less than the significance level $\alpha = 0.05$
So we reject the null hypothesis of $p_1 = p_2$.