



IQRA NATIONAL UNIVERSITY

Name: Sifatullah
ID: #14678
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Submitted to: Ms. Wajiha Amin
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Part “A” (Objectives)

Choose the best answer: **(10)**

i) Chi square distribution is

- a. Normal b. Uniform c. Asymmetrical d. None

ii) A hypothesis is a claim about

- a. Sample statistic b. population parameter c. A study d. all

iii) Type 1 error in hypothesis testing is related to

- a. Rejecting a true null hypothesis
b. Accepting a true null hypothesis
c. Accepting a false alternate hypothesis
d. P value approach.

Part iv) and v) are related to following condition

A manufacturer of fluorescent light bulbs claims that the mean life of these bulbs is 2500 years. A consumer agency wanted to check whether or not this claim is true. The agency took a random sample of 36 such bulbs and tested them. The mean life for the sample was found to be 2447 hours with a standard deviation of 180 hours.

iv) The null and alternative hypotheses are:

- a. $H_0 : \mu \geq 2500; H_1 : \mu < 2500$
b. $H_0 : \mu = 2500; H_1 : \mu \neq 2500$
c. $H_0 : \mu = 2447; H_1 : \mu \neq 2447$
d. $H_0 : \mu \leq 2500; H_1 : \mu > 2500$

v) The test statistic is:

- a. $z = 1.76$ b. $z = -1.76$ c. $t = -0.29$ d. $t = 0.29$

vi) f distribution is associated with

- a. Population mean
b. Population proportion
c. One population variance
d. Two population variance.

vii) If p-value is greater than α , we will

- a. Accept the null hypothesis
b. Reject the null hypothesis
c. No effect on decision
d. Accept the alternate hypothesis.

viii) If value of α i.e. the level of significance isn't specified, then we take it at.....

Answer: 5%

ix) Acceptance and rejection region in the critical region approach is associated with hypothesis.

Answer: Null

x) test is used when σ is unknown.

Answer: T- test (t – statics).

Part “B” (Question)

Question (1st) “a”

For each of the following statements if tested, write the null and alternate hypothesis.

(5)

Answer (1st) “a”:

1. **The normal person has an average IQ of 100.**
 $H_0: \mu = 100$
 $H_A: \mu \neq 100$
2. **More than 65% of cola drinkers prefer Coke to Pepsi.**
 $H_0: \pi = 0.65$
 $H_A: \pi \neq 0.65$
3. **Waiting time to place an order has changed from the mean time of 4.5 min.**
 $H_0: \mu = 4.5$
 $H_A: \mu \neq 4.5$

Question (1st) “b”

If following are the results for hypothesis testing, analyze whether you will accept or reject null hypothesis.

(5)

Value of test statistic	Value for critical region	Type of test
-1.57	-3.06	Left tail
4.9	3.2	Two tail
1.8	0.8	Right tail

Answer (1st) “b”:

$$Z = -1.57$$

- a) So – 3.06 lies in rejection region
- b) So 3.06 lies in acceptance region
- c) So 0.8 lies in acceptance region

Question (2nd) “a”

John wants to send packages by courier and determine the variability in charges. A random sample of 18 packages give the standard deviation \$1.22. Construct 80% and 98% confidence interval for the variance in charges of packets. **(6)**

Answer (2nd) “a”:

- a) For 80% Confidence Level = $1.021 \leq \sigma^2 \leq 2.5089$
- b) For 98% Confidence Level = $0.7573 \leq \sigma^2 \leq 3.9486$

Question (2nd) “b”

Write the table values for the following. **(4)**

Answer (2nd) “b”:

❖ **Write t value and chi square value**

- ❖ $n = 12$, $\alpha = 1\%$ \Rightarrow t – value = 3.1058
- ❖ $n = 12$, $\alpha = 1\%$ \Rightarrow Chi Square $\pi^2 = 26.757$

❖ **Write f value**

- $n_1 = 25$, $n_2 = 5$ $\alpha = 0.01$
- For $V_1 = n_1 - 1$
 $25 - 1 = 24$
 - For $V_2 = n_2 - 1$
 $5 - 1 = 4$

f table value is

- ❖ when $V_1 = 24$ & $V_2 = 4$ f – table value = 20.03
- ❖ when $V_1 = 4$ & $V_2 = 14$ f – table value = 4.89

❖ **Write z table value:**

$Z = -2.22$ Value in table = 0.0132

Question (3rd) "B" (a)

A machine is used to dispense liquid dressing on salad. The mean dispense was 8 ounces with a standard deviation of 0.15 ounce. A sample of 50 bottles taken show the mean content dispensed was 7.955. Test at 1% level of significance that the mean content dispensed is not 8 ounces. Also find the p value. (4)

Answer (3rd) "B" (a):

$$\mu = 8 \quad \sigma = 0.15 \quad n = 50 \quad \bar{x} = 7.955 \quad \alpha = 1\% = 0.01$$

$$P = X/n = \frac{7.955}{50} = 0.1591$$

1) $H_0: \mu = 8$

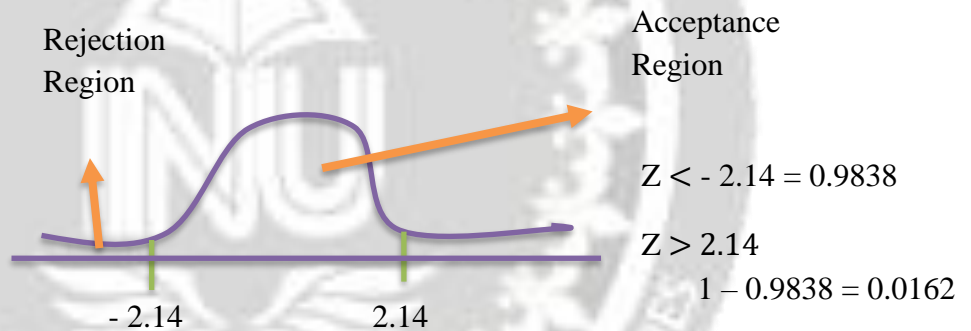
$H_1: \mu \neq 8$

2) $\alpha = 0.01$

3) Z - Test

$$Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

4)



5) $Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$

$$Z = \frac{7.955 - 8}{0.15 / \sqrt{50}} = \frac{-0.045}{0.15 / 7.07} = \frac{-0.045}{0.021} = -2.14$$

Now P - value;

$$P(Z > 2.14) = 0.9838$$

$$1 - 0.9838 = 0.0162$$

$$P(Z < -2.14) = 0.0162$$

$$P = 0.0162 + 0.0162 = 0.0324$$

❖ P is Greater than α and we accept H_0 and reject H_A .

Question (3rd) “B” (b)

The following information is available for two samples taken from two populations.

- ❖ $n_1 = 16$ and $n_2 = 13$
- ❖ Std. deviation of 1st sample = 6.88 and std. deviation for 2nd sample = 6.04

Construct 95% confidence interval for two population variances. (3)

Answer (3rd) “B” (b):

$$0.4080 < \frac{\sigma^2}{\sigma^2} < 3.839$$



Question (4th) “A”

Shipment of pressurized tanks were tested for the minimum pressure that was 1000_{kPa}. For testing 8 tanks were selected with a mean pressure of 980_{kPa} and sample standard deviation of 9_{kPa}. Test the hypothesis at 0.01 level of significance that the population mean content is less than 1000_{kPa}. (write all steps)

(7)

Answer (4th) “A”:

$\mu = 1000$ $S = 9$ $\alpha = 1\% = 0.01$ $\bar{x} = 980$

- 1) $H_0: \mu = 1000$
 $H_1: \mu < 1000$

- 2) $\alpha = 0.01$
 $1 - 0.01 = 0.99$ Finding “t” From Table $t = 2.33$, $t < - 2.33$

- 3) t – Test

$$t = \frac{\bar{X} - \mu}{S / \sqrt{n}}$$

$t > - 2.33$

Rejection Region

Acceptance Region

- 4)



- 5) $t = \frac{\bar{x} - \mu}{s / \sqrt{n}}$

$$t = \frac{980 - 1000}{9 / \sqrt{8}} = \frac{-20}{9 / 2.8284} = \frac{-20}{3.1819} = -6.285$$

Value – 6.28 is less – 2.33 so we reject H_0 and accept H_1
for example, population mean contest is less than 1000kpa, - 6.29 lies in rejection region.

Question (4th) “B”

Suppose p value for the above test is 0.002, what will be your decision?

(3)

Answer (4th) “B”:

P – value = 0.002

$\alpha = 0.01$

P – value < α

$0.002 < 0.01$

So we reject H_0 and accept H_1 .