Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110
NAAC A++
Ph.: 07104-237919, 234623, 329249, 329250 Fax: 07104-232376, Website: www.ycce.edu

Department of Computer Technology B. Tech in Computer Science and Engineering (IOT)

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Session 2025-2026

Vision: To develop analytical and statistical thinking skills in students by applying hypothesis testing methods, enabling them to validate real-world claims using sample data.	• **Mission:** The mission of this practical is to help students apply hypothesis testing to real-life problems, develop skills in formulating and testing claims, and interpret results using statistical tools like the z-test for effective decision-making.

Program Educational Objectives of the program (PEO): (broad statements that describe the professional and career accomplishments)

PEO1	**Preparation**	**P: Preparation**	**Pep-CL abbreviation pronounce as Pep-si-lL easy to recall**
PEO2	**Core Competence**	**E: Environment (Learning Environment)**	
PEO3	**Breadth**	**P: Professionalism**	
PEO4	**Professionalism**	**C: Core Competence**	
PEO5	**Learning Environment**	**L: Breadth (Learning in diverse areas)**	

Program Outcomes (PO): (statements that describe what a student should be able to do and know by the end of a program)

Keywords of POs:
Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

PSO Keywords: Cutting edge technologies, Research

"I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life." *to contribute to the development of cutting-edge technologies and Research*.

Integrity: I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

Name and Signature of Student and Date
(Signature and Date in Handwritten)

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110
NAAC A++
Ph.: 07104-237919, 234623, 329249, 329250 Fax: 07104-232376, Website: www.ycce.edu

Department of Computer Technology B. Tech in Computer Science and Engineering (IOT)

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Session	**2025-26 (ODD)**	**Course Name**	**Mathematical Foundation Of Data Analysis**
Semester	**5**	**Course Code**	**23IOT1526**
Roll No	**42**	**Name of Student**	**Karan F. Chopkar**

Practical Number	**5**
Course Outcome	□ Apply hypothesis testing techniques to validate or reject real-world claims using sample data. □ Demonstrate the ability to compute and interpret statistical test results such as the z-test. □ Develop critical thinking and decision-making skills through practical application of statistical methods.
Aim	To find the hypothesis test is null and should be rejected or accepted.
Problem Definition	A Telecom service provider claims that individual customers pay on an average 400 rs. Per month with standard deviation of 25 rs. A random sample of 50 customers bills during a given month is taken with a mean of 250 and standard deviation of 15. What to say with respect to the claim made by the service provider?
Theory (100 words)	**Theory** Hypothesis testing is a statistical method to check whether a population parameter claim is true using sample data. Steps: 1. **State Hypotheses** o H_0: $\mu = 400$ (average monthly bill is 400 Rs.) o H_1: $\mu \neq 400$ (average monthly bill is not 400 Rs.) 2. **Select Significance Level ($\alpha = 0.05$).** 3. **Compute Test Statistic** o Use z-test: z=x¯−μσ/nz = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} 4. **Decision Rule**

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

	○ If |z| > z(critical), reject H_0; otherwise, accept H_0. ○ Since sample mean (250 Rs.) is very far from 400 Rs., the null hypothesis is rejected. ○ Hence, the provider's claim is **not supported**.
Procedure and Execution (100 Words)	**Procedure** 1. Collect the given information: ○ Claimed population mean (μ) = 400 Rs. ○ Population standard deviation (σ) = 25 Rs. ○ Sample size (n) = 50. ○ Sample mean ($\bar{x}$) = 250 Rs. ○ Sample standard deviation (s) = 15 Rs. 2. Formulate hypotheses: ○ H_0: μ = 400 ○ H_1: μ ≠ 400 3. Choose significance level (α = 0.05). 4. Apply the **z-test** formula: $z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$ 5. Compare the calculated z value with the critical value from z-table (±1.96 for 5% level). 6. Take a decision: ○ If |z| > 1.96 → Reject H_0. ○ If |z| ≤ 1.96 → Accept H_0.

	Code: Part - A
	# Given values
	mu_0 <- 400 # Claimed population mean
	sigma <- 25 # Population standard deviation
	x_bar <- 250 # Sample mean
	n <- 50 # Sample size
	
	# Calculate z-statistic
	z <- (x_bar - mu_0) / (sigma / sqrt(n))
	
	# Calculate p-value for two-tailed test
	p_value <- 2 * (pnorm(z))
	
	# Print the results
	cat("Z-statistic:", z, "\n")

```
cat("P-value:", p_value, "\n")

# Decision
alpha <- 0.05  # Significance level
if (p_value < alpha) {
  cat("Reject the null hypothesis: The sample does not support the provider's
claim.\n")
} else {
  cat("Fail to reject the null hypothesis: The sample supports the provider's
claim.\n")
}
```

Part – B :

```
# Given values
mu_0 <- 799       # Claimed population mean
sigma <- 60       # Population standard deviation
x_bar <- 760      # Sample mean
n <- 40           # Sample size

# Calculate z-statistic
z <- (x_bar - mu_0) / (sigma / sqrt(n))

# Calculate p-value for two-tailed test
p_value <- 2 * (pnorm(z))


# Print the results
cat("Z-statistic:", z, "\n")
cat("P-value:", p_value, "\n")

# Decision
alpha <- 0.05  # Significance level
if (p_value < alpha) {
  cat("Reject the null hypothesis: The sample provides evidence that the average
monthly bill is 799 rupees.\n")
} else {
  cat("Fail to reject the null hypothesis: There is not enough evidence to say the
average monthly bill is 799 rupees.\n")
}
```

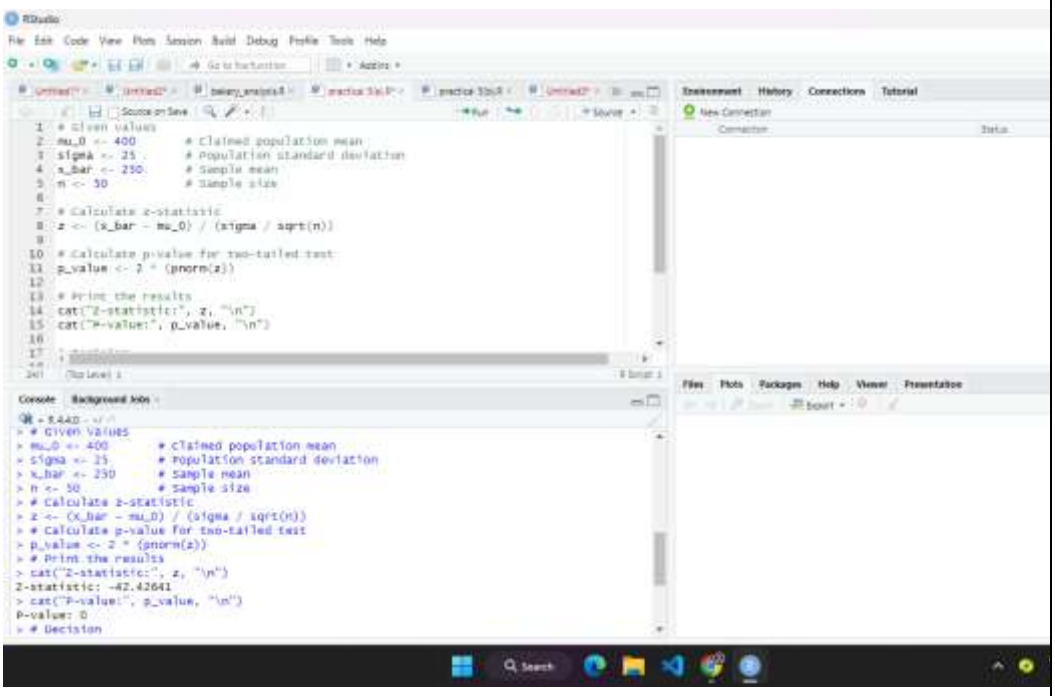
Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Output:

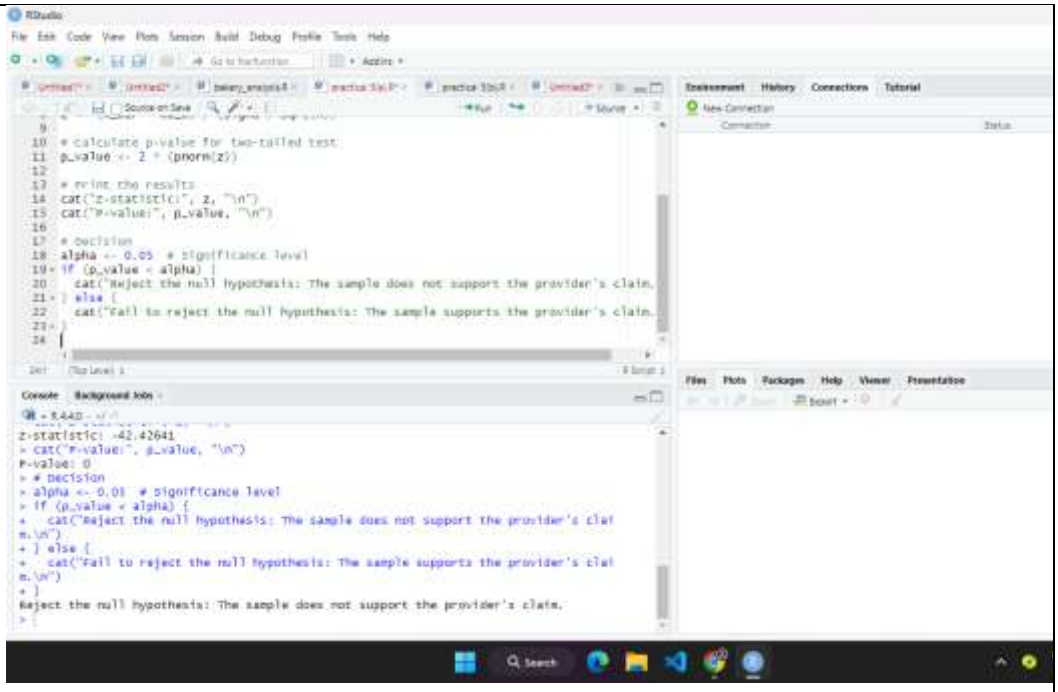


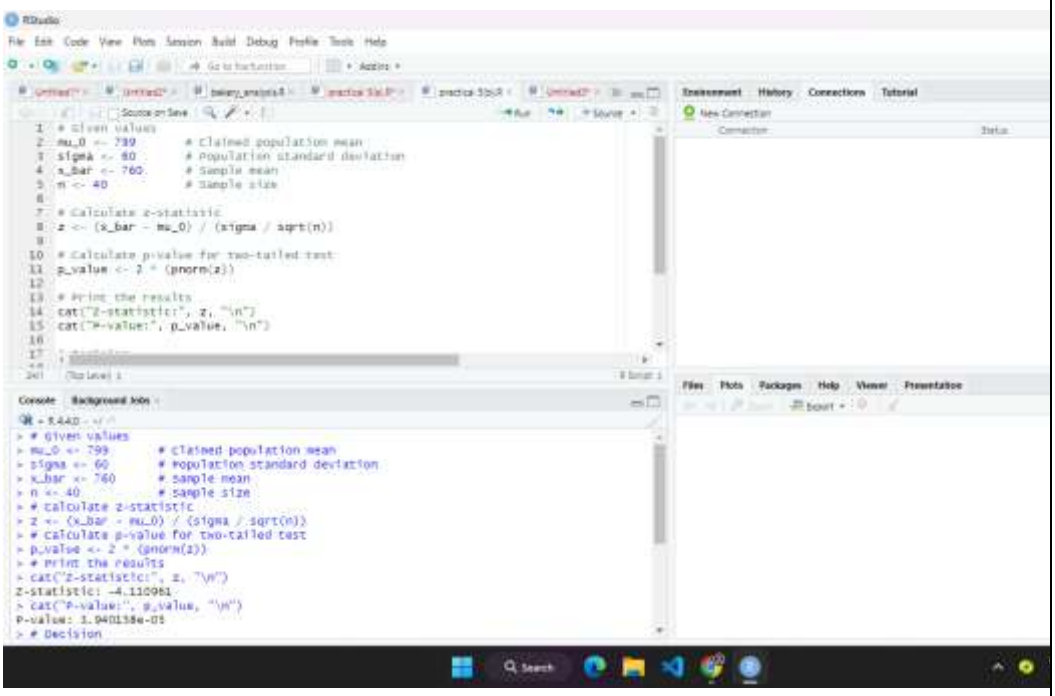
Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.



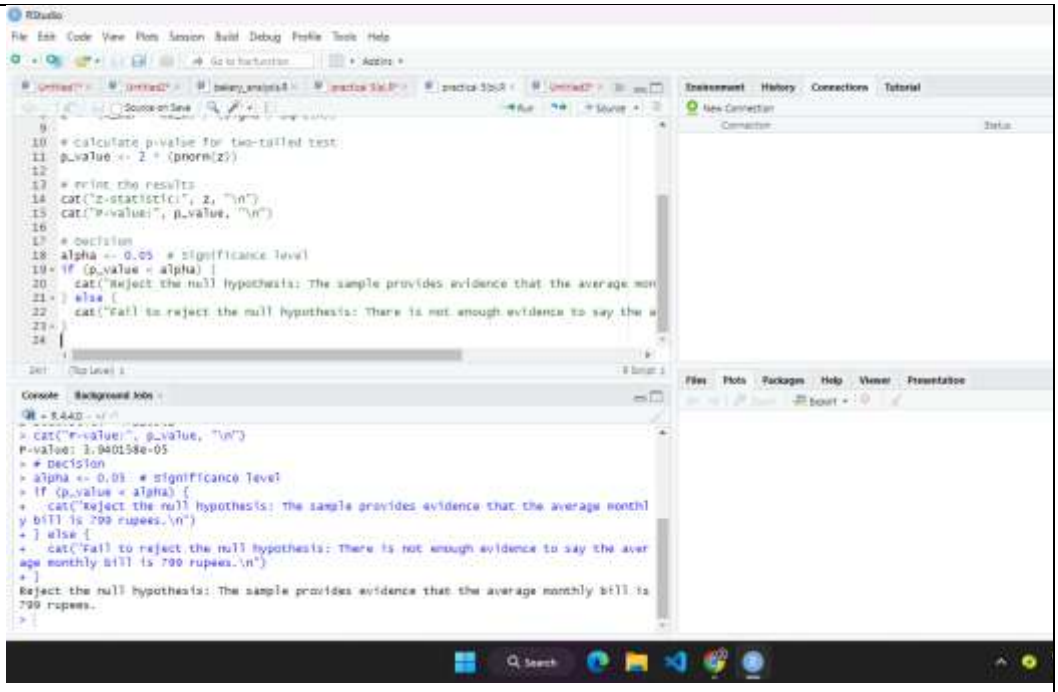


Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

	
Output Analysis	The null hypothesis is rejected as the calculated z-value (–42.45) lies in the rejection region. Hence, the telecom provider's claim that the average monthly bill is 400 Rs. is **not supported** by the sample data.
Link of student Github profile where lab assignment has been uploaded	https://github.com/karan-0123/MFDA-Lab
Conclusion	Based on the hypothesis test, the calculated z-value shows a significant difference between the claimed mean (400 Rs.) and the observed sample mean (250 Rs.). Therefore, the null hypothesis is rejected, and it is concluded that the telecom service provider's claim about the average monthly bill is **not true**.

Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
Hingna Road, Wanadongri, Nagpur - 441 110
NAAC A++
Ph.: 07104-237919, 234623, 329249, 329250 Fax: 07104-232376, Website: www.ycce.edu

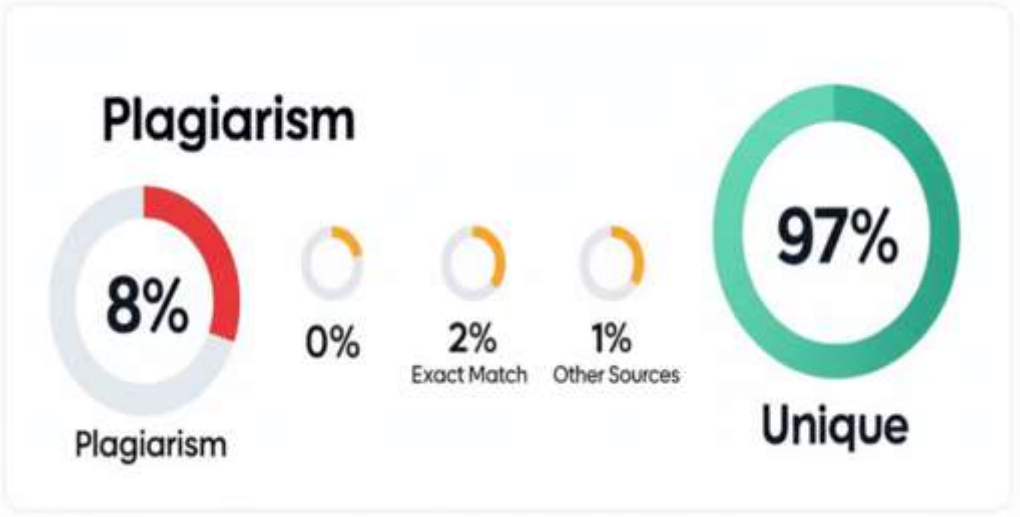
Department of Computer Technology B. Tech in Computer Science and Engineering (IOT)

Vision of the Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Plag Report (Similarity index < 12%)	
Date	04/09/2025