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
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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:** Empower learners to make rigorous, data-driven decisions by mastering hypothesis testing for real-world quality assurance and product validation.	• **Mission:** Empower learners to make rigorous, data-driven decisions by mastering hypothesis testing for real-world quality assurance and product validation.

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)

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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	**4**
Course Outcome	• Apply one-sample z-tests to evaluate claims about a population mean when the population standard deviation is known. • Compute and interpret test statistics, critical values, and p-values to make hypothesis testing decisions. • Translate real-world claims into statistical hypotheses and draw evidence-based conclusions at a specified significance level.
Aim	To draw a conclusion using a hypothesis.
Problem Definition	Suppose the manufactures claim that the means lifetime of a light bulb is more than 10,000 hours. In a sample of 30 light bulbs, it was found that they only last 9,900 hours on average. Assume the population standard deviation is 120 hours. At 0.5 significance level. Can we reject the claim by the manufacturer?
Theory (100 words)	In this practical, we apply **hypothesis testing** to verify the manufacturer's claim about the mean lifetime of light bulbs. The **null hypothesis (H_0)** states that the mean lifetime is 10,000 hours, while the **alternative hypothesis (H_1)** suggests that the mean is less than or equal to 10,000 hours, contradicting the claim of being higher. Since the population standard deviation is known, a **z-test** is appropriate. We calculate the test statistic using the sample mean, population mean, standard deviation, and sample size. The result is compared with the critical z-value at a **0.05 significance level**. If the test statistic falls into the rejection region, we conclude that the manufacturer's claim cannot be supported with sufficient statistical evidence.

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Procedure and Execution (100 Words)	Steps for implementation: **Here are the steps for implementation (one-sample z-test, height-tailed):** • State hypotheses H0: μ≤10000H_0:\ \mu \le 10000 (not exceeding 10,000) vs H1: μ>10000H_1:\ \mu > 10000 (manufacturer's claim). • Set significance level α=0.05\alpha = 0.05. • Collect sample info Sample size n=30n=30, sample mean x¯=9900\bar{x}=9900, known σ=120\sigma=120, hypothesized mean μ0=10000\mu_0=10000. • Compute standard error SE=σ/nSE=\sigma/\sqrt{n}. • Compute test statistic z=x¯−μ0SEz=\dfrac{\bar{x}-\mu_0}{SE}. • Find critical value / p-value Critical z0.95=1.645z_{0.95}=1.645 for right tail, or compute p=Pr[f0](Z≥z)p=\Pr(Z\ge z). • Decision rule If z>1.645z>1.645 (or p<0.05p<0.05), reject H0H_0; otherwise fail to reject H0H_0. • Conclusion Interpret in context: if you fail to reject H0H_0, you cannot support the manufacturer's ">10,000 hours" claim.

	Code:
	xbar <- 9900 # Sample mean
	mu0 <- 10000 # Claimed mean
	sigma <- 120 # Population standard deviation
	n <- 30 # Sample size
	alpha <- 0.5 # Significance level
	
	# Test statistic (z)
	z <- (xbar - mu0) / (sigma / sqrt(n))
	z
	
	# p-value (left-tailed test)
	p_value <- pnorm(z)
	p_value
	
	# Conclusion

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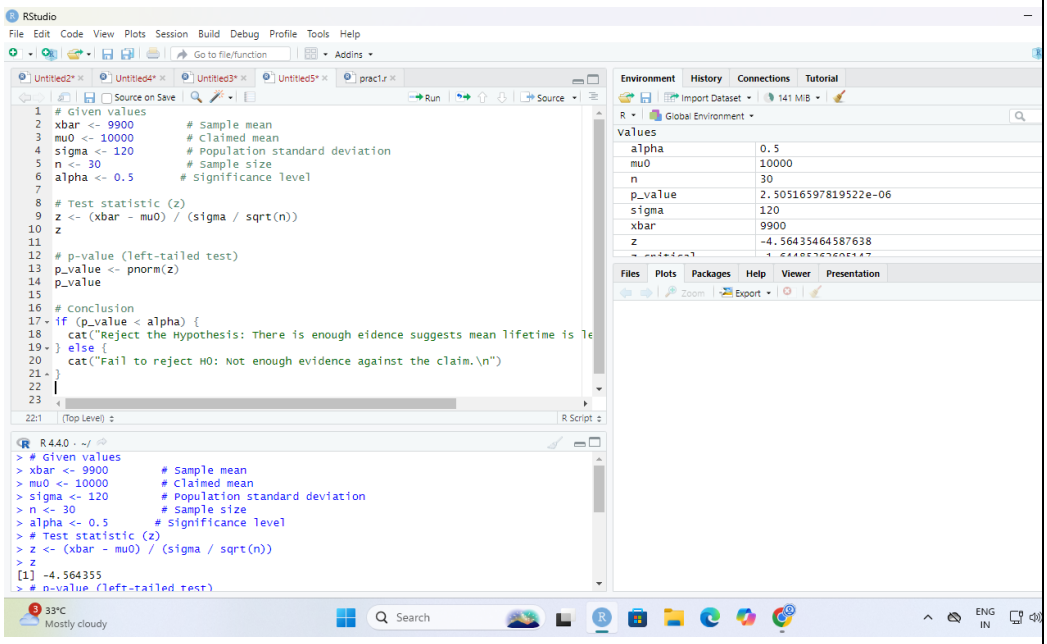
```
if (p_value < alpha) {
  cat("Reject the Hypothesis: There is enough eidence suggests mean lifetime is less than 10,000 hours.\n")
} else {
  cat("Fail to reject H0: Not enough evidence against the claim.\n")
}
```

Output:



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	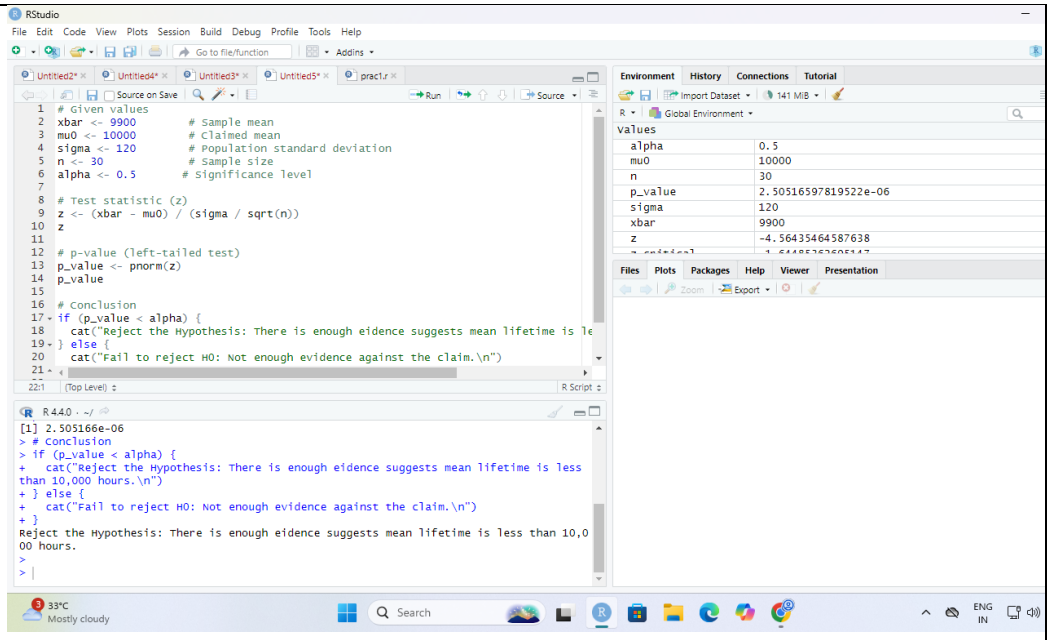
Output Analysis	From the R output, the test statistic value is around **–4.56**, and the p-value is extremely small (almost zero). Since this p-value is much smaller than the chosen significance level of 0.05, we clearly reject the null hypothesis. This means that the sample data provides strong evidence that the average lifetime of the bulbs is **less than 10,000 hours**. Therefore, the manufacturer's claim that the bulbs last more than 10,000 hours is not supported. In fact, the analysis suggests that the true mean lifetime is significantly lower than the claimed value.
Link of student Github profile where lab assignment has been uploaded	https://github.com/karan-0123/MFDA-Lab
Conclusion	There is strong evidence the true mean lifetime is < 10,000 hours. Therefore, the manufacturer's claim that bulbs last more than 10,000 hours is not supported (effectively rejected).

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