

Faculty of Engineering / Science

End Semester Examination May 2025

CS3ES15 / BC3ES15 Research Methodology

Programme	:	B.Tech. / B.Sc.	Branch/Specialisation	:	CSE All / CS
Duration	:	3 hours	Maximum Marks	:	60

Note: All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary.
 Notations and symbols have their usual meaning.

Section 1 (Answer all question(s))				Marks CO BL
Q1. Which of the following best describes the difference between research methods and research methodology?				1 1 1
<input checked="" type="radio"/> Research methods refer to techniques used to conduct research, whereas methodology refers to the theoretical framework guiding research.				
<input checked="" type="radio"/> Research methodology focuses on data collection, while research methods focus on analysis.				
Q2. Which of the following research types is least concerned with immediate real-world applications but instead focuses on expanding knowledge?				1 2 2
<input checked="" type="radio"/> Applied research				
<input checked="" type="radio"/> Empirical research				
Q3. When conducting a critical literature review, which of the following is the most effective way to identify gap areas in existing research?				1 1 2
<input checked="" type="radio"/> Summarizing findings of previous research without comparison				
<input checked="" type="radio"/> Relying only on primary sources and ignoring secondary sources				
Q4. What is the key difference between primary and secondary sources in literature review?				1 1 2
<input checked="" type="radio"/> Primary sources provide first-hand information, whereas secondary sources interpret and analyze primary sources				
<input checked="" type="radio"/> Secondary sources contain only summaries and lack any critical analysis				
Q5. Ethical dilemmas in research often arise due to conflicts between personal interests and professional integrity. A researcher who manipulates experimental data to align with a desired hypothesis is engaging in which form of scientific misconduct?				1 2 2
<input checked="" type="radio"/> Redundant publication				
<input checked="" type="radio"/> Fabrication				
Q6. A researcher submits a manuscript to a journal after checking it through plagiarism detection software. The software reports a 25% similarity index, with most matches coming from properly cited sources. The best course of action in this scenario is to:				1 3 4
<input checked="" type="radio"/> Modify and resubmit the manuscript with altered wording to lower similarity				
<input checked="" type="radio"/> Exclude all cited materials from the manuscript to reduce similarity index				
<input checked="" type="radio"/> Proceed with submission, as properly cited sources are not considered plagiarism				
<input checked="" type="radio"/> Use a different plagiarism detection tool to get a more favorable report				

Q7. A researcher wants to analyze the relationship between two categorical variables. Which statistical test is most appropriate for hypothesis testing? 1 2 4

- Pearson's Correlation Coefficient
- Chi-Square Test
- ANOVA
- Linear Regression

Q8. A researcher executes a study using stratified sampling to ensure representation from different subgroups. This method primarily helps in: 1 1 2

- Increasing the sample size
- Reducing sampling bias
- Simplifying data analysis
- Eliminating the need for hypothesis testing

Q9. A well-structured research report should include which of the following elements to ensure clarity and coherence? 1 2 2

- Abstract, Literature Review, Data Interpretation, Conclusion, Appendix
- Hypothesis, Research Design, Footnotes, Bibliography, Acknowledgments
- Introduction, Methodology, Results, Discussion, References
- Title Page, Keywords, Methodology, Raw Data, Citations

Q10. A researcher wants to manage references efficiently while ensuring proper citations in their paper. Which feature of reference management tools like Mendeley, EndNote, and Zotero provides the most benefit? 1 3 3

- Automatic data collection from websites without requiring user validation
- Real-time citation tracking and impact factor prediction for individual references
- Integration with word processors for citation insertion and bibliography generation
- Integration with word processors for citation insertion and bibliography generation

Section 2 (Answer all question(s))

Marks CO BL

Q11. Explain the key differences between fundamental and applied research with suitable examples. 2 1 2

Rubric	Marks
difference between fundamental and applied research. (1) example for fundamental and applied research(1)	2

Q12. Why is it essential to consider both the characteristics and prerequisites of research before starting a study? Explain with reference to a real-world research scenario. 3 3 4

Rubric	Marks
Give essential characteristics and prerequisites of research before starting a study (2). example(1)	3

- Q13. (a)** A researcher wants to study the impact of social media on students' academic performance. Identify the most suitable type of research (Descriptive, Analytical, Fundamental, Applied, Quantitative, Qualitative, Conceptual, or Empirical) and justify your choice.

5 4 3

Rubric	Marks
Give explanation for choosing a particular method. (3) Explain in detail with your choice (2)	5

(OR)

- (b)** A company wants to introduce a new product in the market and needs to conduct research to understand consumer preferences. Should they opt for fundamental or applied research? Justify your answer.

Rubric	Marks
Give justification for the choice.(3) explanation.(2)	5

Section 3 (Answer all question(s))

Marks CO BL

- Q14.** Why is it essential to critically analyze both primary and secondary sources when conducting a literature review for defining a research problem? 2 2 2

Rubric	Marks
Give reason for the analysis of primary and secondary sources when conducting a literature review.(1) How do you define a research problem.(1)	2

- Q15.** Discuss the key criteria that should be considered when selecting a research problem. How does defining the problem properly contribute to the research's success? 3 2 2

Rubric	Marks
explain the criteria when selecting a research problem.(1) defining the problem properly contribute to the research's success: explain why.(2)	3

Q16. (a) Scenario: You are conducting a literature review on the application of deep learning techniques for automated medical image analysis in the diagnosis of diabetic retinopathy (DR). After reviewing a significant number of research papers, you notice a trend where many studies focus on classifying images into "presence" or "absence" of DR. However, there is a lack of research exploring the *severity grading* of DR using deep learning, particularly with the integration of multi-modal imaging data (e.g., combining retinal fundus images with optical coherence tomography (OCT) scans).

5 3 3

Based on the given scenario, describe three specific gap areas in the current literature concerning the application of deep learning in diabetic retinopathy diagnosis.

For each gap area, explain why it is a significant limitation and propose one potential research direction to address that gap.

Rubric	Marks
Identification of gaps. (3 Marks)	5
Explanation of significance. (1 Mark)	
Research direction proposals. (1 Mark)	

(OR)

(b) Imagine you are tasked with developing a research project to address the issue of declining student engagement in online learning environments.

Clearly define and formulate a specific research problem related to this issue.

Outline two key factors that contribute to this problem and briefly explain why they are relevant.

Rubric	Marks
Definition and Formulation of the Research Problem (2 Marks)	5
Identification of Two Key Contributing Factors (2 Marks)	
Brief Explanation of Relevance (1 Mark)	

Section 4 (Answer all question(s))

Marks CO BL

Q17. Briefly explain the difference between a descriptive moral judgment and a prescriptive moral judgment.

2 3 2

Rubric	Marks
What are the terms descriptive moral judgment and a prescriptive moral judgment: Explain.(1) difference.(1)	2

Q18. Explain the concept of plagiarism and discuss why maintaining intellectual honesty is crucial in research. Provide one specific example of how plagiarism can negatively impact the academic community.

3 2 1

Rubric	Marks
concept of plagiarism and discuss why maintaining intellectual honesty is crucial in research.(2) one specific example of how plagiarism can negatively impact the academic community.(1)	3

- Q19. (a)** Critically analyze the ethical concerns surrounding automated plagiarism detection tools, including issues of false positives, data privacy, and their effectiveness in curbing intentional plagiarism.

5 4 4

Rubric	Marks
Explanation of Ethical Concerns (2 Marks)	
Critical Analysis (2 Marks)	5
Conclusion and Justification (1 Mark)	

(OR)

- (b)** In what ways can redundant publications be considered a form of research misconduct, and how do they impact scientific progress? Discuss at least two cases where researchers faced consequences for redundant publications.

Rubric	Marks
Explain redundant publications be considered a form of research misconduct. (2.5)	5
Give least two cases where researchers faced consequences for redundant publications.(2.5)	

Section 5 (Answer all question(s))

Marks CO BL

- Q20.** A researcher claims that the average time spent on social media by teenagers is more than 3 hours per day. A random sample of 50 teenagers reveals a sample mean of 3.5 hours with a sample standard deviation of 1.2 hours. At a significance level of 0.05, test the researcher's claim. State the null and alternative hypotheses, calculate the test statistic, determine the critical value, and provide your conclusion.

4 4 4

Rubric	Marks
State the null and alternative hypotheses, and the test to be conducted.(2)	4
calculate the test statistic, determine the critical value, and provide your conclusion.(2)	

- Q21. (a)** Explain the concept of a "p-value" in statistical hypothesis testing. How is it used to determine the statistical significance of a result? What are the common thresholds used to interpret p-values?

6 2 4

Rubric	Marks
concept of a "p-value" in statistical hypothesis testing.(3)	6
How is it used to determine the statistical significance of a result, and what are the common thresholds used to interpret p-values?(3)	

(OR)

- (b)** Describe the key steps involved in a typical data processing and analysis pipeline, from raw data acquisition to generating actionable insights. For each step, briefly discuss the potential challenges and strategies for mitigating those challenges.

Rubric	Marks
key steps involved in a typical data processing and analysis pipeline. (3)	6
briefly discuss the potential challenges and strategies for mitigating those challenges.(3)	

Section 6 (Answer any 2 question(s))

Marks CO BL

Q22. Given a complex research project with diverse data sources, how would you strategically employ both citation databases like Web of Science and reference management tools like Zotero to ensure comprehensive literature review and accurate report compilation, while justifying your chosen research metrics for evaluating the project's impact? 5 5 4

Rubric	Marks
employ both citation databases like Web of Science and reference management tools like Zotero to ensure comprehensive literature review and accurate report compilation.(3) justifying your chosen research metrics for evaluating the project's impact.(2)	5

Q23. Considering the challenges of integrating data from various indexing databases and handling evolving research metrics, devise a robust strategy for managing bibliography, referencing, and footnotes within a research report while accurately reflecting the provenance and significance of cited works. 5 4 4

Rubric	Marks
Understanding of Challenges in Data Integration (1 Mark) Strategy for Effective Bibliography Management (1 Mark) Approach to Referencing and Citation Accuracy (1 Mark) Handling Footnotes and Provenance of Cited Works (1 Mark) Overall Coherence and Practicality of the Strategy (1 Mark)	5

Q24. Analyze the subtle differences between citation databases like Web of Science and Scopus in terms of their coverage, indexing methodologies, and resulting research metrics. 5 5 5

Rubric	Marks
Explanation of the scope of Web of Science (WoS) and Scopus. (1 Mark) Indexing Methodologies (1.5 Marks) Research Metrics (1.5 Marks) Critical Comparison & Conclusion (1 Mark)	5
