

DETAILED ANSWER KEY WITH MARKING SCHEME

Subject: Research Methodology & IPR (MTPESCS102T)

Course: F.Y. M.Tech (CSE – Cyber Security)

Semester: I

Max Marks: 60

RM&IPR_SET_1

Q.1 (12 Marks) – CO1 (K2)

Solve ANY ONE

Q1(A) Explain research approaches used in scientific investigations. Differentiate between basic and applied research.

Expected Answer:

Research approaches:

- **Quantitative approach:** Uses numerical data, statistical analysis, and hypothesis testing.
- **Qualitative approach:** Uses interviews, observations, and textual analysis to understand phenomena.
- **Mixed approach:** Combines both quantitative and qualitative methods.

Basic Research:

- Focuses on theory development and knowledge generation.
- Example: Studying encryption algorithms mathematically.

Applied Research:

- Focuses on solving practical problems.
- Example: Implementing encryption in secure communication systems.

Marking Scheme (12 Marks):

Component	Marks
Explanation of research approaches	6
Basic research explanation + example	3
Applied research explanation + example	3
Total	12

Q1(B) Explain the process of defining a research problem. Discuss the necessity of ethics in engineering research.

Expected Answer:

Defining a research problem:

1. Identification of broad area
2. Literature survey
3. Identification of research gap
4. Problem statement formulation
5. Feasibility and clarity check

Necessity of ethics:

- Ensures honesty and integrity
- Avoids plagiarism and data manipulation
- Protects human subjects
- Builds public trust in engineering solutions

Marking Scheme (12 Marks):

Component	Marks
Steps in defining research problem	6
Importance of ethics	4
Relevance/examples	2
Total	12

Q.2 (12 Marks) – CO2 (K2)

Solve ANY ONE

Q2(A)(i) Objectives of literature review (6 Marks)

Answer Points:

- Identify research gaps
- Avoid duplication
- Understand methodologies
- Develop theoretical background
- Refine objectives

Marking: 1 mark per valid point × 6

Q2(A)(ii) Development of theoretical framework (6 Marks)

Answer Points:

- Identifies key variables
- Shows relationships between variables
- Based on existing theories

- Guides hypothesis formulation

Marking:

- Concept explanation – 3
 - Steps/diagram/example – 3
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Q2(B)(i) Conceptual framework with example (6 Marks)

Expected Answer:

- Definition of conceptual framework
- Difference from theoretical framework
- Example (e.g., Online learning → Performance)

Marking:

Component Marks

Definition 2

Explanation 2

Example 2

Q2(B)(ii) Descriptive and diagnostic research designs (6 Marks)

Answer Points:

- Descriptive: Describes characteristics of population
- Diagnostic: Identifies causes of a problem

Marking:

- Descriptive design – 3
 - Diagnostic design – 3
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Q.3 (12 Marks) – CO3 (K2)

Solve ANY ONE

Q3(A) Probability & non-probability sampling, measurement & scaling

Expected Answer:

Probability sampling:

- Simple random, stratified, systematic

Non-probability sampling:

- Convenience, judgment, quota

Measurement & scaling:

- Nominal, ordinal, interval, ratio
- Importance in accuracy and analysis

Marking Scheme:

Component	Marks
Probability sampling	4
Non-probability sampling	4
Measurement & scaling	4
Total	12

Q3(B) Survey & experimental methods, selection of methods**Marking Scheme:**

Component	Marks
Survey method	4
Experimental method	4
Selection criteria	4
Total	12

Q.4 (12 Marks) – CO3 / CO4 (K3)

Solve ANY ONE

Q4(A)(i) Null & alternative hypothesis (6 Marks)**Marking:**

- Definition of H_0 – 2
 - Definition of H_1 – 2
 - Example – 2
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Q4(A)(ii) P-value approach (6 Marks)**Marking:**

- Concept of P-value – 2
- Decision rule – 2
- Interpretation – 2

Q4(B) Chi-square test, Monte Carlo & Simplex methods (12 Marks)

Component	Marks
Chi-square test explanation	6
Monte Carlo method	3
Simplex method	3
Total	12

Q.5 (12 Marks) – CO5 (K3)

Solve ANY ONE

Q5(A)(i) Steps in writing research report (6 Marks)

Steps (any six):

- Title
- Abstract
- Introduction
- Methodology
- Results
- Conclusion

Marking: 1 × 6

Q5(A)(ii) Significance of technical writing (6 Marks)

Marking:

- Clarity – 2
 - Accuracy – 2
 - Professional communication – 2
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Q5(B) International IPR frameworks & role of IPR (12 Marks)

Component	Marks
International IPR frameworks (WIPO, TRIPS, Paris Convention)	6
Role of IPR in innovation & commercialization	6
Total	12