

Sub:	VTU QP Solutions							
	Research Methodology & IPR							
Sub code	22RMI18	Duration:	3 hrs	Max Marks:	100	Sem:	I	

Note : Answer FIVE FULL Questions, choosing ONE full question from each Module

CBCS SCHEME



 First Semester MCA Degree Examination, Jan./Feb. 2023
Research Methodology and IPR

22RMI18

Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
 2. M : Marks, L: Bloom's level, C: Course outcomes.*

		M	L	C
Module – 1				
Q.1	a. Define Research. Elaborate on the objectives and significance of research.	10	L2	CO1
	b. Explain the different types of research with an example for each.	10	L2	CO1
OR				
Q.2	a. Distinguish between Research Method and Research Methodology.	10	L2	CO1
	b. Illustrate the various steps involved in Research process with a neat diagram.	10	L2	CO1
Module – 2				
Q.3	a. Define a research problem. Summarize the main techniques involved in defining a research problem.	10	L2	CO1
	b. Explain the issues involved in defining a research and discuss on the necessity of defining the problem.	10	L2	CO1
OR				
Q.4	a. Explain the literature review functions in research work and state the way in which it can help research.	10	L2	CO2
	b. Illustrate the steps involved to conduct literature review for research and explain each one briefly	10	L2	CO2
Module – 3				
Q.5	a. Discuss fully the important concept relating to research design.	10	L2	CO3
	b. Briefly explain about importance of experimental design. Mention its types and explain any one in each type.	10	L2	CO3
OR				
Q.6	a. Illustrate the steps that the researcher should pay attention while developing a sample design.	10	L2	CO3
	b. The following are the number of departmental stores in 15 cities: 35, 17, 10, 32, 70, 28, 26, 19, 26, 66, 37, 44, 33, 29 and 28. If we want to select a sample of 10 stores, using cities as clusters and selecting within clusters proportional to size, how many stores from each city should be chosen? (Use a starting point of 10).	10	L3	CO3
Module – 4				
Q.7	a. Clearly explain the differences between collection of data through questionnaire and schedules.	10	L2	CO4
	b. Interpret the various steps involved in writing a report.	10	L3	CO4
OR				
Q.8	a. What is interpretation? Discuss on the precautions that need to be taken by the research for correct interpretation.	10	L2	CO4
	b. Elaborate on the different types of reports.	10	L2	CO4
Module – 5				
Q.9	a. What is intellectual property? What are the different types of it?	10	L2	CO5
	b. Explain briefly the Indian Patent Act 1970.	10	L2	CO5
OR				
Q.10	a. Explain the importance of IPR in recent times.	10	L2	CO5
	b. Discuss the salient features of Copyright Act 1957.	10	L2	CO5

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Q1 a. Define Research. Elaborate on the objectives and significance of research.

Research commonly refers to a search for knowledge.

One can also define research as a scientific and systematic search for pertinent information on a specific topic

In fact, research is an art of scientific investigation.

- Redman and Mory define research as a “systematized effort to gain new knowledge.”
- Research is an academic activity and as such the term should be used in a technical sense.

Research objectives fall into a number of following broad groupings:

1. To gain familiarity with a phenomenon or to achieve new insights into it (studies with this object in view are termed as exploratory or formulative research studies);
2. To portray accurately the characteristics of a particular individual, situation or a group (studies with this object in view are known as descriptive research studies);
3. To determine the frequency with which something occurs or with which it is associated with something else (studies with this object in view are known as diagnostic research studies);
4. To test a hypothesis of a causal relationship between variables (such studies are known as hypothesis-testing research studies).

-Significance of Research:

- Increased amounts of research make progress possible. Research inculcates scientific and inductive thinking, and it promotes the development of logical habits of thinking and organisation.
- The role of research in several fields of applied economics, whether related to business or to the economy as a whole, has greatly increased in modern times.
- Research provides the basis for nearly all government policies in our economic system.
- Research has its special significance in solving various operational and planning problems of business and industry.
- Research is equally important for social scientists in studying social relationships and in seeking answers to various social problems.

In addition to what has been stated above, the significance of research can also be understood keeping in view the following points:

- a) To those students who are to write a master's or Ph.D. thesis, research may mean a careerism or a way to attain a high position in the social structure;
- b) To professionals in research methodology, research may mean a source of livelihood;
- c) To philosophers and thinkers, research may mean the outlet for new ideas and insights
- d) To literary men and women, research may mean the development of new styles and creative work;
- e) To analysts and intellectuals, research may mean the generalisations of new theories.

b. Explain the different types of research with an example.

Different types of research are:

- (i) Descriptive vs. Analytical
- (ii) Applied vs. Fundamental
- (iii) Quantitative vs. Qualitative
- (iv) Conceptual vs. Empirical
- (v) Some Other Types of Research

Descriptive vs. Analytical

- Descriptive research(Ex post facto research) includes surveys and fact-finding enquiries of different kinds, including comparative and correlational methods.
- The major purpose of descriptive research is description of the state of affairs as it exists at present.
- The main characteristic of this method is that the researcher has no control over the variables; he can only report what has happened or what is happening for example frequency of shopping, preferences of people, or similar data.
- In analytical research, on the other hand, the researcher has to use facts or information already available, and analyze these to make a critical evaluation of the material.

Applied vs. Fundamental

- Research can either be applied (or action) research or fundamental (to basic or pure) research.
- Applied research aims at finding a solution for an immediate problem facing a society or an industrial/business organization. Research to identify social, economic or political trends that may affect a particular institution/organization. Ex: study to improve customer retention for a company
- Fundamental research is mainly concerned with generalizations and with the formulation of a theory. Research concerning some natural phenomenon or relating to pure mathematics are examples of fundamental research. Research studies, concerning human behaviour with a view to make generalizations, are examples of Fundamental research.

Quantitative vs. Qualitative

- Quantitative research is based on the measurement of quantity or amount. Gathering quantifiable data and performing statistical or computation techniques.

Ex:

For instance, when we are interested in investigating the reasons for human behavior —Motivational Research:- This type of research aims at discovering the motives and desires, used in depth interviews.

- Qualitative research, on the other hand, is concerned with qualitative phenomenon, i.e., phenomena relating to or involving quality or kind.

Ex:

—Attitude or opinion research:- This research designed to find out how people feel or what they think about a particular subject or institution.

Conceptual vs. Empirical

- Conceptual research is that related to some abstract idea(s) or theory. It is generally used by philosophers and thinkers to develop new concepts or to reinterpret existing ones.
- empirical research relies on experience or observation alone, often without due regard for system and theory. In such a research, the researcher must first provide himself with a working hypothesis or guess as to the probable results. He then works to get enough facts (data) to prove or disprove his hypothesis. Empirical research is appropriate when proof is sought that certain variables affect other variables in some way

Some Other Types of Research

- one-time research or longitudinal research: In the former case the research is confined to a single time-period ex: population research. whereas in the latter case the research is carried on over several time-periods ex: panel study.
- field-setting research or laboratory research or simulation research: manipulates the factors
- clinical or diagnostic research: going deep into the causes of understanding customer problems. .
- exploratory research: Development of hypothesis without being tested.
- formalized research: Development of structure with hypothesis testing.
- Historical research is that which utilizes historical sources like documents, remains, etc. to study events or ideas of the past.
- conclusion-oriented: conclusion oriented research, a researcher is free to pick up a problem, redesign the enquiry as he proceeds and is prepared to conceptualize as he wishes.
- decision-oriented: Decision-oriented research is always for the need of a decision maker and the researcher in this case is not free to embark upon research

Ex: Operations research

Q2. a. Distinguish between research method and research methodology.

Research method and research methodology are two terms that are often used interchangeably, but they have distinct meanings in the context of research.

Research Method: A research method refers to a specific technique or procedure used to collect and analyze data in a research study. It is a specific tool or approach used to gather information, such as surveys, interviews, experiments, or observations. Research methods are the "how" of research, describing the specific procedures used to collect and analyze data.

Examples of research methods include:

- Surveys
- Interviews
- Experiments
- Observational studies
- Content analysis
- Statistical analysis

Research Methodology: Research methodology, on the other hand, refers to the overall framework or approach used to conduct a research study. It encompasses the entire research process, including the research design, sampling strategy, data collection methods, data analysis procedures, and interpretation of results. Research methodology is the "why" and "what" of research, providing a justification for the research question, objectives, and methods used.

Research methodology involves:

- Research design (e.g., experimental, quasi-experimental, survey)
- Sampling strategy (e.g., random sampling, stratified sampling)
- Data collection methods (e.g., surveys, interviews, observations)
- Data analysis procedures (e.g., statistical analysis, thematic analysis)
- Interpretation of results
- Research ethics and validity considerations

Methodology

- Philosophical basis for research (truth-seeking or perspective-seeking); determines methods
- Deals with axioms pursuant to generating *new knowledge* (i.e., reality, knowing, logic, values)
- Rational or philosophical assumptions that underlie approaches to research; analysis of principles, rules, postulates (assumptions), and axioms employed by a discipline to frame research
- Leads to *new knowledge* that is eventually added to a discipline's cumulative body of knowledge
- Section in research paper should be called *Methodology*

Method

- Procedures or instruments used to collect and analyze data and report results or findings, determined by methodology
- Deals with the technical steps taken to generate or produce *new data and information*
- Documented process for managing research project that contains procedures, definitions, and explanations of the techniques used to collect, store, and analyze data and write research report
- Leads to *new data* and then new knowledge when interpreted using methodological assumptions
- Section in research paper should be called *Methods*

b. illustrate various steps involved in research process with a neat diagram.



The research process is a systematic and structured approach to conducting research. It involves a series of steps that help researchers to identify a problem, gather and analyze data, and draw conclusions based on the findings. Here is a general outline of the research process:

Step 1: Problem Identification

- Identify a problem or issue that needs to be addressed
- Conduct a preliminary literature review to understand the context and scope of the problem
- Formulate a research question or hypothesis to guide the study

Step 2: Literature Review

- Conduct an in-depth review of existing research on the topic

- Analyze and synthesize the findings to identify gaps and limitations in current knowledge
- Develop a conceptual framework or theoretical model to guide the study

Step 3: Research Design

- Determine the research design and methodology to be used (e.g., experimental, survey, case study)
- Identify the population and sample to be studied
- Develop a data collection plan and instruments (e.g., questionnaires, interviews)

Step 4: Data Collection

- Collect data from the sample or population using the chosen methodology
- Ensure data quality and integrity through data cleaning and validation

Step 5: Data Analysis

- Analyze the data using statistical or qualitative methods
- Identify patterns, trends, and relationships in the data
- Draw conclusions based on the findings

Step 6: Results

- Present the findings in a clear and concise manner
- Use visual aids (e.g., tables, graphs, charts) to facilitate understanding
- Highlight the implications of the findings

Step 7: Discussion

- Interpret the results in light of the research question or hypothesis
- Discuss the limitations and strengths of the study
- Implications for theory, practice, or policy

Step 8: Conclusion

- Summarize the main findings and implications
- Restate the research question or hypothesis and how it was addressed
- Provide recommendations for future research

Step 9: Reporting

- Write a research report or paper that presents the findings and implications
- Follow the guidelines of the target journal or conference
- Ensure clarity, concision, and accuracy in the reporting

Q3.a. Define research problem. Summarize the main techniques involved in research problem.

Definition of Research Problem:

A research problem is a specific issue or question that a researcher aims to investigate and resolve through a systematic and scientific approach. It is a gap in current knowledge or understanding that needs to be addressed, and the researcher seeks to find answers or solutions to this problem through data collection, analysis, and interpretation. A well-defined research problem provides a clear direction and focus for the research study, guiding the researcher in formulating hypotheses, selecting research methods, and collecting and analyzing data.

Main Techniques Involved in Defining a Research Problem:

1. **Literature Review:** Conducting a thorough review of existing research on the topic to identify gaps, inconsistencies, and areas that require further investigation.
2. **Problem Identification:** Identifying a specific issue or question that needs to be addressed, based on personal experience, observations, or practical problems.
3. **Problem Formulation:** Clearly defining the research problem, including its scope, boundaries, and key variables involved.
4. **Research Questions:** Formulating specific, concise, and answerable research questions that guide the investigation.
5. **Hypothesis Generation:** Developing hypotheses or educated guesses that provide a tentative explanation for the research problem.
6. **Conceptual Framework:** Developing a conceptual framework that outlines the relationships between variables and provides a theoretical foundation for the study.
7. **Delimitation:** Defining the boundaries and scope of the study, including the population, sample, and data collection methods.
8. **Operationalization:** Defining how key variables will be measured and operationalized in the study.

By employing these techniques, researchers can define a clear and focused research problem that guides the entire research process, from data collection to analysis and interpretation.

b. Explain the issues involved in defining a research and discuss on the necessity of defining a problem.

Issues Involved in Defining a Research Problem:

1. **Ambiguity and Vagueness:** Research problems can be complex and multifaceted, making it challenging to define them clearly and concisely.
2. **Lack of Clarity:** Failing to define the research problem clearly can lead to confusion and misdirection throughout the research process.
3. **Scope and Boundaries:** Defining the scope and boundaries of the research problem can be difficult, particularly when dealing with complex or broad topics.
4. **Theoretical Framework:** Selecting an appropriate theoretical framework to guide the research can be challenging, especially for novice researchers.
5. **Operationalization:** Defining how to measure and operationalize key variables can be problematic, particularly when dealing with abstract or complex concepts.
6. **Research Questions:** Formulating clear and answerable research questions can be difficult, especially when dealing with complex or multifaceted research problems.
7. **Hypothesis Generation:** Developing hypotheses that are testable and relevant to the research problem can be challenging.
8. **Contextual Factors:** Research problems can be influenced by various contextual factors, such as cultural, social, or environmental factors, which can affect the research design and methodology.

Necessity of Defining a Problem:

1. **Clear Direction:** A well-defined research problem provides a clear direction and focus for the research study, guiding the researcher in formulating hypotheses, selecting research methods, and collecting and analyzing data.
2. **Relevance and Significance:** A clearly defined research problem helps to establish the relevance and significance of the study, ensuring that the research is meaningful and contributes to the existing body of knowledge.
3. **Research Design:** A well-defined research problem informs the research design, including the selection of research methods, sampling strategies, and data collection techniques.
4. **Data Collection and Analysis:** A clear research problem guides the data collection and analysis process, ensuring that the data collected is relevant and useful for addressing the research question.
5. **Interpretation and Conclusion:** A well-defined research problem enables the researcher to interpret the findings accurately and draw meaningful conclusions.
6. **Generalizability:** A clearly defined research problem helps to establish the generalizability of the findings, enabling the researcher to apply the results to other contexts and populations.
7. **Research Ethics:** A well-defined research problem ensures that the research is conducted in an ethical manner, with consideration for the rights and welfare of participants.

8. **Research Funding:** A clearly defined research problem is often a requirement for securing research funding, as it demonstrates the researcher's ability to articulate a clear and focused research agenda.

In conclusion, defining a research problem is a crucial step in the research process, as it provides a clear direction and focus for the study, ensures relevance and significance, informs the research design, and guides data collection and analysis. By addressing the issues involved in defining a research problem, researchers can develop a well-defined research problem that sets the stage for a successful and meaningful research study.

Q4.a. Explain the literature review functions in research work and state the way in which it can help research.

Functions of Literature Review in Research Work:

1. **Establishes Context:** A literature review provides an overview of the research topic, establishing the context and background for the study.
2. **Identifies Gaps:** A literature review helps to identify gaps in current knowledge, understanding, and research, which informs the research question and objectives.
3. **Provides Theoretical Framework:** A literature review helps to develop a theoretical framework for the study, outlining the key concepts, theories, and models relevant to the research topic.
4. **Informs Research Design:** A literature review informs the research design, including the selection of research methods, sampling strategies, and data collection techniques.
5. **Identifies Methodological Limitations:** A literature review helps to identify methodological limitations and potential biases in previous studies, which can inform the research design and methodology.
6. **Provides a Basis for Comparison:** A literature review provides a basis for comparison with the findings of the current study, enabling the researcher to evaluate the results in the context of existing knowledge.
7. **Enhances Credibility:** A literature review demonstrates the researcher's knowledge and understanding of the research topic, enhancing the credibility of the study.
8. **Identifies Key Variables:** A literature review helps to identify key variables and concepts relevant to the research topic, which informs the development of research questions and hypotheses.

Ways in which Literature Review can Help Research:

1. **Refines Research Question:** A literature review helps to refine the research question, ensuring that it is specific, focused, and relevant to the research topic.
2. **Informs Research Objectives:** A literature review informs the research objectives, ensuring that they are clear, concise, and achievable.

3. **Develops Hypotheses:** A literature review helps to develop hypotheses that are testable, relevant, and grounded in existing knowledge.
4. **Selects Research Methods:** A literature review informs the selection of research methods, ensuring that they are appropriate, valid, and reliable.
5. **Identifies Potential Sources of Error:** A literature review helps to identify potential sources of error and bias, which can inform the research design and methodology.
6. **Enhances Validity and Reliability:** A literature review enhances the validity and reliability of the study by demonstrating a thorough understanding of the research topic and existing knowledge.
7. **Provides a Framework for Data Analysis:** A literature review provides a framework for data analysis, enabling the researcher to interpret the findings in the context of existing knowledge.
8. **Facilitates Generalizability:** A literature review facilitates generalizability by providing a basis for comparison with other studies, enabling the researcher to apply the findings to other contexts and populations.

In conclusion, a literature review is a critical component of research work, providing a foundation for the study, informing the research design and methodology, and enhancing the credibility and validity of the research. By conducting a thorough literature review, researchers can develop a well-informed and well-designed study that contributes meaningfully to the existing body of knowledge.

b. Illustrate the steps involved to conduct literature review for research and explain each one briefly.

Conducting a Literature Review: A Step-by-Step Guide

Step 1: Define the Research Question

Identify a specific research question or topic to investigate. This will guide the entire literature review process.

Step 2: Conduct Preliminary Research

Perform a preliminary search to gain a broad understanding of the research topic. This involves:

- **Brainstorming keywords:** Identify relevant keywords and phrases related to the research topic.
- **Searching online databases:** Use academic databases, such as Google Scholar, JSTOR, or Web of Science, to find relevant articles and studies.

Step 3: Develop a Search Strategy

Create a comprehensive search strategy to ensure a thorough and systematic search. This includes:

- **Defining inclusion and exclusion criteria:** Determine what types of studies to include or exclude based on factors like study design, population, and publication date.
- **Selecting databases and search engines:** Choose relevant databases and search engines to search for studies.

Step 4: Search for Studies

Execute the search strategy to identify relevant studies. This involves:

- **Searching databases and search engines:** Use the selected databases and search engines to search for studies.
- **Screening titles and abstracts:** Review study titles and abstracts to determine relevance.

Step 5: Evaluate Study Quality

Assess the quality and relevance of each study. This includes:

- **Assessing study design and methodology:** Evaluate the study's design, methodology, and data analysis.
- **Evaluating study limitations:** Identify potential biases, limitations, and flaws in each study.

Step 6: Analyze and Synthesize Findings

Analyze and synthesize the findings from each study. This involves:

- **Extracting relevant data:** Extract relevant data from each study, such as results, conclusions, and recommendations.
- **Identifying patterns and themes:** Identify patterns, themes, and relationships between studies.

Step 7: Draw Conclusions and Make Recommendations

Draw conclusions based on the findings and make recommendations for future research. This includes:

- **Summarizing key findings:** Summarize the main findings and implications of the literature review.
- **Identifying gaps and areas for future research:** Identify gaps in current knowledge and areas for future research.

By following these steps, you can conduct a comprehensive and systematic literature review that provides a solid foundation for your research.

Q5. a. Discuss fully the important concepts relating to research design.

Research design is a crucial aspect of any research study, as it provides a framework for collecting and analyzing data to answer research questions or test hypotheses. A well-designed research study ensures that the data collected is reliable, valid, and generalizable to the population of interest. Here are the important concepts relating to research design:

1. **Research Questions or Hypotheses:** A research study begins with a clear research question or hypothesis that guides the entire study. The research question or hypothesis should be specific, measurable, achievable, relevant, and time-bound (SMART).
2. **Research Objectives:** Research objectives are specific statements that outline what the researcher aims to achieve through the study. They should be concise, clear, and aligned with the research question or hypothesis.
3. **Study Design:** The study design refers to the overall plan or structure of the research study. Common study designs include:
 - Experimental design: involves manipulating one or more independent variables to observe their effect on the dependent variable.
 - Quasi-experimental design: involves manipulating one or more independent variables, but lacks random assignment of participants.
 - Non-experimental design: involves observing variables without manipulating them.
 - Survey design: involves collecting data through self-report measures, such as questionnaires or interviews.
4. **Sampling Strategy:** A sampling strategy refers to the method used to select participants for the study. Common sampling strategies include:
 - Probability sampling: involves selecting participants randomly from the population.
 - Non-probability sampling: involves selecting participants based on convenience, quota, or purposive sampling.
5. **Sample Size:** The sample size refers to the number of participants selected for the study. A larger sample size generally provides more reliable and generalizable results.

6. **Data Collection Methods:** Data collection methods refer to the techniques used to gather data from participants. Common data collection methods include:
 - Surveys: self-report measures, such as questionnaires or interviews.
 - Observational studies: involve observing participants in their natural environment.
 - Experiments: involve manipulating variables and measuring their effect.
7. **Data Analysis:** Data analysis refers to the process of examining and interpreting the data collected. Common data analysis techniques include:
 - Descriptive statistics: summarize and describe the data.
 - Inferential statistics: draw conclusions about the population based on the sample data.
8. **Reliability and Validity:** Reliability refers to the consistency of the data collection method, while validity refers to the accuracy of the data collected. Researchers should strive to ensure that their data collection methods are both reliable and valid.
9. **Ethics:** Research ethics refer to the principles and guidelines that govern the conduct of research. Researchers should ensure that their study is conducted in an ethical manner, with respect for participants' rights and dignity.
10. **Generalizability:** Generalizability refers to the extent to which the findings of the study can be applied to the larger population. Researchers should strive to ensure that their study is generalizable to the population of interest.
11. **Replication:** Replication refers to the process of repeating a study to verify its findings. Replication is essential to establish the reliability and generalizability of research findings.

In conclusion, research design is a critical aspect of any research study, and understanding these important concepts is essential to ensure that the study is conducted in a rigorous and systematic manner. By carefully considering these concepts, researchers can increase the validity, reliability, and generalizability of their findings.

b. Briefly explain about importance of experimental design. Mention its types and explain any one in each type.

Experimental design is crucial in research as it allows researchers to establish cause-and-effect relationships between variables, isolate the effect of the independent variable, and minimize confounding variables.

(a) Informal experimental designs:

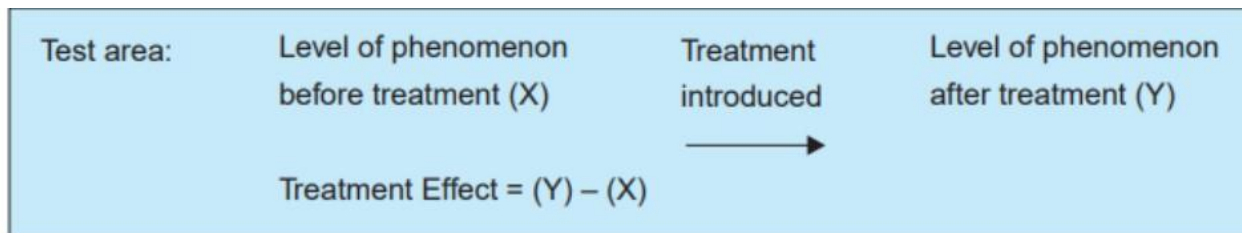
1. Before-and-after without control design.
2. After-only with control design.

3. Before-and-after with control design.

(b) Formal experimental designs:

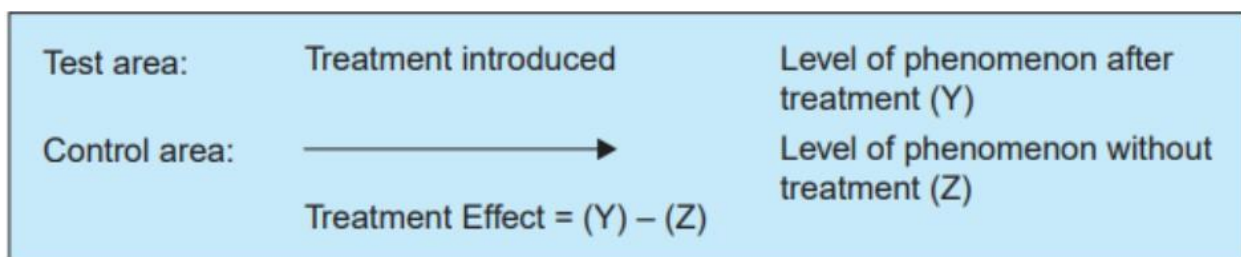
1. Completely randomized design (C.R. Design).
2. Randomized block design (R.B. Design).
3. Latin square design (L.S. Design).
4. Factorial designs.

Before-and-after without control design:



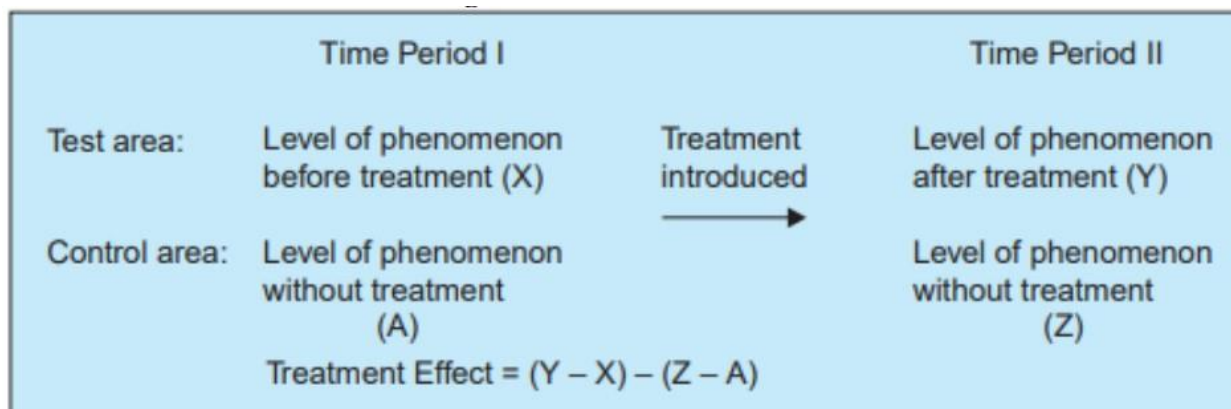
A single test group or area is selected and the dependent variable is measured before the introduction of the treatment. The treatment is then introduced and the dependent variable is measured again after the treatment has been introduced. The effect of the treatment would be equal to the level of the phenomenon after the treatment minus the level of the phenomenon before the treatment. The main difficulty of such a design is that with the passage of time considerable extraneous variations may be there in its treatment effect.

After-only with control design:



Two groups or areas (test area and control area) are selected and the treatment is introduced into the test area only. The dependent variable is then measured in both the areas at the same time. Treatment impact is assessed by subtracting the value of the dependent variable in the control area from its value in the test area. The basic assumption in such a design is that the two areas are identical with respect to their behavior towards the phenomenon considered. If this assumption is not true, there is the possibility of extraneous variation entering into the treatment effect.

Before-and-after with control design:



Two areas are selected and the dependent variable is measured in both the areas for an identical timeperiod before the treatment. The treatment is then introduced into the test area only, and the dependent variable is measured in both for an identical time-period after the introduction of the treatment. The treatment effect is determined by subtracting the change in the dependent variable in the control area from the change in the dependent variable in test area. This design is superior to the above two designs for the simple reason that it avoids extraneous variation resulting both from the passage of time and from non-comparability of the test and control areas. But at times, due to lack of historical data, time or a comparable control area, we should prefer to select one of the first two informal designs stated above.

RANDOMIZED BLOCK DESIGN

	Very low I.Q.	Low I.Q.	Average I.Q.	High I.Q.	Very high I.Q.
	Student A	Student B	Student C	Student D	Student E
Form 1	82	67	57	71	73
Form 2	90	68	54	70	81
Form 3	86	73	51	69	84
Form 4	93	77	60	65	71

Suppose four different forms of a standardized test in statistics were given to each of five students (selected one from each of the five I.Q. blocks) and following are the scores which they obtained. If each student separately randomized the order in which he or she took the four tests (by using random numbers or some similar device), we refer to the design of this experiment as a R.B. design. The purpose of this randomization is to take care of such possible extraneous factors (say as fatigue) or perhaps the experience gained from repeatedly taking the test.

Q6.a. Illustrate steps that the researcher should pay attention while developing a sample design.

Steps to Develop a Sample Design:

1. Define the Population:

- Identify the target population for the study.
- Determine the population size and characteristics.

2. Determine the Sample Size:

- Decide on the desired level of precision and confidence.
- Use statistical formulas or tables to determine the required sample size.

3. Choose a Sampling Frame:

- Identify a list or database that represents the population.
- Ensure the sampling frame is accurate, complete, and up-to-date.

4. Select a Sampling Method:

- Random sampling: simple, stratified, or cluster sampling.
- Non-random sampling: convenience, quota, or purposive sampling.

5. Consider Sampling Errors:

- Non-response error: participants who refuse to participate or are unreachable.
- Non-coverage error: participants who are not included in the sampling frame.
- Measurement error: errors in data collection or measurement.

6. Evaluate Sample Representativeness:

- Ensure the sample is representative of the population.
- Check for biases in the sample selection process.

7. Plan for Data Collection:

- Decide on the data collection method: survey, interview, observation, or experiment.
- Develop a data collection instrument: questionnaire, interview guide, or observation protocol.

8. Pilot Test the Sample Design:

- Test the sample design with a small pilot study.
- Evaluate the effectiveness of the sample design and make adjustments as needed.

Example:

A researcher wants to study the attitudes of university students towards online learning. The researcher follows these steps to develop a sample design:

1. **Define the Population:** University students enrolled in online courses.
2. **Determine the Sample Size:** 500 students, with a margin of error of 5% and a confidence level of 95%.
3. **Choose a Sampling Frame:** University student database.
4. **Select a Sampling Method:** Stratified random sampling, with strata based on student demographics (age, gender, and academic level).
5. **Consider Sampling Errors:** Non-response error (students who don't respond to the survey), non-coverage error (students not enrolled in online courses), and measurement error (errors in survey questions or data entry).
6. **Evaluate Sample Representativeness:** Ensure the sample is representative of the university student population, with a mix of ages, genders, and academic levels.
7. **Plan for Data Collection:** Online survey, with a questionnaire developed to measure attitudes towards online learning.
8. **Pilot Test the Sample Design:** Pilot test the survey with 50 students to evaluate the effectiveness of the sample design and make adjustments as needed.

By following these steps, the researcher can develop a robust sample design that ensures the study's findings are reliable, valid, and generalizable to the population.

b. The following are the number of departmental stores in 15 cities: 35, 17, 10, 32, 70, 28, 26, 19, 26, 66, 37, 44, 33, 29 and 28. If we want to select a sample of 10 stores, using cities as clusters and selecting within clusters proportional to size, how many stores from each city should be chosen? (Use a starting point of 10).

<i>City number</i>	<i>No. of departmental stores</i>	<i>Cumulative total</i>	<i>Sample</i>
1	35	35	10
2	17	52	
3	10	62	60
4	32	94	
5	70	164	110
6	28	192	160
7	26	218	210
8	19	237	
9	26	263	260
10	66	329	310
11	37	366	360
12	44	410	410
13	33	443	
14	29	472	460
15	28	500	

Q7. a. Clearly explain the differences between collection of data through questionnaire and schedules.

Collection of Data through Questionnaire:

A questionnaire is a self-administered data collection tool that consists of a series of questions designed to gather information from respondents. The questionnaire is typically distributed to a sample of individuals, who complete it on their own and return it to the researcher.

Characteristics of Questionnaire:

1. **Self-administered:** Respondents complete the questionnaire on their own.
2. **Structured:** Questions are pre-determined and follow a specific format.
3. **Standardized:** Same questions are asked to all respondents.

4. **Flexibility:** Respondents can complete the questionnaire at their own pace and convenience.
5. **Cost-effective:** Reduces the cost of data collection, as no interviewer is required.

Advantages of Questionnaire:

1. **Increased response rate:** Respondents are more likely to participate, as they can complete the questionnaire at their convenience.
2. **Reduced bias:** Respondents are less likely to be influenced by the interviewer's presence or opinions.
3. **Cost-effective:** Reduces the cost of data collection.

Collection of Data through Schedules:

A schedule is a data collection tool that involves a face-to-face interview between the researcher and the respondent. The researcher asks a series of questions, and the respondent provides answers, which are recorded by the researcher.

Characteristics of Schedules:

1. **Face-to-face:** Researcher interacts with the respondent in person.
2. **Structured:** Questions are pre-determined and follow a specific format.
3. **Standardized:** Same questions are asked to all respondents.
4. **Controlled environment:** Researcher can control the environment and ensure that respondents understand the questions.
5. **Immediate clarification:** Researcher can clarify any doubts or questions respondents may have.

Advantages of Schedules:

1. **In-depth information:** Respondents can provide detailed and in-depth answers.
2. **Clarification:** Researcher can clarify any doubts or questions respondents may have.
3. **Higher response rate:** Respondents are more likely to participate, as they can ask questions and clarify doubts.

Key differences between Questionnaire and Schedules:

Administration: Questionnaire is self-administered, while schedules involve a face-to-face interview.

Depth of information: Schedules can gather more in-depth information, while questionnaires may provide more superficial answers.

Cost and time: Questionnaires are generally less expensive and time-consuming than schedules.

Control: Schedules provide more control over the data collection process, while questionnaires rely on respondents to complete the questionnaire accurately.

In summary, questionnaires are suitable for large-scale studies, where cost and time are a concern, and the research question requires standardized and structured data. Schedules are more suitable for studies that require in-depth information, clarification, and control over the data collection process.

b. Interpret the various steps involved in writing a report.

Steps Involved in Writing a Report:

Writing a report involves several steps that help to ensure that the report is well-structured, informative, and effective in communicating the intended message. The following are the various steps involved in writing a report:

Step 1: Define the Purpose and Scope of the Report

- Identify the purpose of the report: What is the report intended to achieve?
- Define the scope of the report: What topics will be covered, and what will be excluded?
- Determine the target audience: Who will be reading the report?

Step 2: Gather and Organize Information

- Collect relevant data and information: Use various sources such as books, articles, interviews, and observations.
- Organize the information: Use an outline or a mind map to categorize and structure the information.

Step 3: Develop a Report Outline

- Create a detailed outline: Break down the report into sections and subsections.
- Determine the report's structure: Decide on the order of the sections and the flow of the report.

Step 4: Write the Report

- Write the introduction: Introduce the topic, provide background information, and state the purpose of the report.
- Write the body: Present the findings, analysis, and discussion of the topic.
- Write the conclusion: Summarize the main points, reiterate the purpose, and provide recommendations.
- Write the recommendations: Provide actionable suggestions based on the findings.

Step 5: Edit and Revise the Report

- Review the report: Check for clarity, coherence, and grammar.
- Edit the report: Make revisions to improve the report's structure, content, and style.
- Proofread the report: Check for errors in spelling, punctuation, and formatting.

Step 6: Add Visual Aids and Appendices

- Include visual aids: Use tables, figures, charts, and graphs to illustrate key points.
- Add appendices: Include supplementary information that supports the report's findings.

Step 7: Finalize the Report

- Format the report: Use a standard format, such as APA or MLA.
- Add a title page: Include the report's title, author's name, and date.
- Add a table of contents: Provide a list of the report's sections and page numbers.

Step 8: Submit the Report

- Submit the report: Deliver the report to the intended audience.
- Provide a summary: Prepare a brief summary of the report's key findings and recommendations.

Tips for Writing a Good Report:

- Use clear and concise language.
- Use proper grammar and punctuation.
- Use headings and subheadings to organize the report.
- Use visual aids to illustrate key points.
- Edit and revise the report carefully.
- Proofread the report for errors.

By following these steps, you can create a well-structured and effective report that communicates your message clearly and concisely.

Q8.a. What is interpretation? Discuss on the precautions that need to be taken by the research for correct interpretation.

Interpretation is the process of assigning meaning to the data collected during research. It involves analyzing and explaining the findings, identifying patterns and relationships, and drawing conclusions based on the data. Interpretation is a critical step in the research process, as it helps to answer the research question, test hypotheses, and provide insights into the phenomenon being studied.

Precautions for Correct Interpretation:

To ensure correct interpretation, researchers must take the following precautions:

1. **Avoid Bias:** Researchers should be aware of their own biases and try to minimize their influence on the interpretation of data. This can be achieved by using objective methods, such as statistical analysis, and involving multiple researchers in the interpretation process.

2. **Understand the Data:** Researchers should have a thorough understanding of the data, including its limitations, strengths, and weaknesses. This helps to avoid misinterpretation of the data and ensures that the findings are accurately represented.
3. **Use Appropriate Statistical Methods:** Researchers should use appropriate statistical methods to analyze the data, taking into account the type of data, sample size, and research design. This helps to ensure that the results are reliable and generalizable.
4. **Consider Alternative Explanations:** Researchers should consider alternative explanations for the findings, rather than jumping to conclusions. This helps to rule out other possible explanations and increases the confidence in the interpretation.
5. **Be Aware of Context:** Researchers should be aware of the context in which the data was collected, including cultural, social, and environmental factors. This helps to ensure that the findings are interpreted in a way that takes into account the complexities of the research setting.
6. **Use Multiple Sources of Data:** Researchers should use multiple sources of data, such as quantitative and qualitative data, to triangulate the findings and increase the validity of the interpretation.
7. **Avoid Over-Interpretation:** Researchers should avoid over-interpreting the data, recognizing that the findings may not be generalizable to all populations or contexts.
8. **Consider the Limitations of the Study:** Researchers should acknowledge the limitations of the study, including the sample size, data collection methods, and research design. This helps to provide a more nuanced interpretation of the findings.
9. **Use Clear and Concise Language:** Researchers should use clear and concise language when presenting the findings, avoiding technical jargon and complex statistical terminology.
10. **Peer Review:** Researchers should subject their interpretation to peer review, allowing other experts to review and critique the findings and interpretation.

By taking these precautions, researchers can increase the validity and reliability of their interpretation, ensuring that the findings are accurately represented and the research question is adequately addressed.

b. Elaborate on the different types of reports.

Research reports can vary significantly in length and type, with their format largely dictated by the specific problems they address. Here is an overview of different types of reports, primarily focusing on technical and popular reports:

Types of Reports

Technical Report

Purpose: Used when a comprehensive written report of the study is required, either for record-keeping or public dissemination.

Emphasis: On methods employed, assumptions made, detailed presentation of findings, and supporting data.

Structure:

Summary of Results: Brief review of main findings in two or three pages.

Nature of the Study: Description of study objectives, problem formulation, working hypothesis, type of analysis, and data required.

Methods Employed: Specific methods used in the study, including sample design, size, and selection.

Data: Discussion on data collected, sources, characteristics, limitations, and suitability.

Analysis of Data and Presentation of Findings: Detailed presentation of analysis and findings with supporting tables and charts.

Conclusions: Summary of findings and policy implications.

Bibliography: List of sources consulted.

Technical Appendices: Additional technical details like questionnaires, mathematical derivations, and analysis techniques.

Index: Comprehensive index at the end of the report.

Considerations: Clear presentation and ready availability of findings are important, often using charts and diagrams liberally.

Popular Report

Purpose: Used when research results have policy implications and need to be understood by a broader audience.

Emphasis: On simplicity and attractiveness, with minimal technical details.

Structure: Introduction: Clear statement of the problem and objectives.

Methods: Brief overview of methods used without technical jargon.

Findings: Simplified presentation of findings using charts and diagrams.

Other Forms of Reports

Letter Reports: Preferred by business firms, typically short (one or two pages).

Balance-Sheet Type Reports: Common in financial institutions for annual reports.

Mathematical Notations: Used by mathematicians to present their findings.

Symbols and Formulae: Preferred by chemists. Literary Reports: Used in literature, presenting critical analyses with liberal use of quotations.

Experimentation Reports: Common in education and psychology, often with detailed statistical tables.

Case-History Reports: Used by clinical psychologists and social pathologists.

News Reports: On-the-scene accounts or interview compilations in newspapers.

Book Reviews: Analyze book content, author's intentions, style, and point of view.

Governmental and Special Commission Reports: Comprehensive reports on specific issues, often considered important research products.

Ph.D. Theses and Dissertations: Detailed academic reports prepared by students

Q9. a. What is intellectual property? What are the different types of it?

Types of Intellectual Property:

There are several types of intellectual property, including:

1. **Patents:** Protect inventions, such as processes, machines, manufactures, and compositions of matter. Patents give the inventor the exclusive right to make, use, and sell their invention for a certain period of time.

Example: A new smartphone design or a medical device.

2. **Copyrights:** Protect original literary, dramatic, musical, and artistic works, such as books, music, movies, and software. Copyrights give the creator the exclusive right to reproduce, distribute, and display their work.

Example: A novel, a song, or a video game.

3. **Trademarks:** Protect symbols, names, and logos used to identify a business or product. Trademarks help to distinguish a company's goods or services from those of others.

Example: The Nike swoosh logo or the Coca-Cola brand name.

4. **Trade Secrets:** Protect confidential and valuable information, such as business methods, recipes, or software code. Trade secrets are not publicly disclosed and are protected by confidentiality agreements and other security measures.

Example: The recipe for Coca-Cola or the algorithm used by Google's search engine.

5. **Industrial Designs:** Protect the appearance of a product, including its shape, configuration, and ornamentation. Industrial designs are used to protect the aesthetic aspects of a product.

Example: The design of a chair or a car.

6. **Geographical Indications:** Protect the names of places or regions that are associated with a particular product or service. Geographical indications help to ensure that products meet certain standards or have a specific origin.

Example: Champagne from the Champagne region of France or Scotch whisky from Scotland.

7. **Domain Names:** Protect the unique addresses used to identify websites on the internet. Domain names are used to direct users to a specific website.

Example: google.com or amazon.com.

8. **Plant Varieties:** Protect new and distinct plant varieties, including genetically modified organisms. Plant varieties are used to protect the intellectual property rights of plant breeders.

Example: A new variety of corn or a genetically modified soybean.

These are the main types of intellectual property, but there may be others depending on the jurisdiction and the specific laws in place.

b. Explain briefly the Indian Patent Act 1970.

A patent is a legal document granted by a government that gives the patent holder exclusive rights to make, use, and sell an invention for a specified period, usually 20 years from the filing date. The invention must be new, useful, and non-obvious. Patents are crucial for encouraging innovation as they provide inventors with the protection needed to invest time and resources into their inventions. Indian Patent Act of 1970 The Indian Patent Act of 1970 is a significant piece of legislation that governs the patent system in India. Here are the key aspects of the Act:

1. Inception and Purpose:

- The Act was enacted in 1970 and came into force on April 20, 1972. It was introduced to amend and consolidate the laws relating to patents in India.
- The main objective of the Act is to encourage inventions and ensure that the inventions are made available to the public at reasonable terms.

2. Types of Patents:

- The Act provides for the grant of patents for inventions which are new, involve an inventive step, and are capable of industrial application.

3. Patentability Criteria:

- An invention must be novel, non-obvious, and useful to be patentable.
- It should not fall into non-patentable categories such as abstract theories, discoveries of scientific principles, mere arrangements or re-arrangements of known devices, methods of agriculture or horticulture, and traditional knowledge.

4. Process of Patent Application:

- Filing an application: An inventor must file a patent application with the Indian Patent Office.
- Publication: The application is published 18 months after filing.
- Examination: Upon request, the application is examined by a patent examiner who checks the compliance with patentability criteria.
- Grant: If the invention meets all requirements, a patent is granted.

5. Rights and Obligations:

- The patent holder has exclusive rights to use, manufacture, and market the invention.

- These rights are territorial, meaning they are only applicable in the country where the patent is granted.

- The patent holder must disclose the complete details of the invention to the public.

6. Term of Patent:

- Patents are granted for a term of 20 years from the date of filing of the application.

7. Amendments and Reforms:

- The Act has undergone several amendments to align with international treaties such as the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement.

- Significant amendments were made in 2005 to allow product patents in all fields of technology, including pharmaceuticals and agro-chemicals.

8. Compulsory Licensing:

- The Act includes provisions for compulsory licensing, where the government can allow others to produce a patented product without the consent of the patent holder under certain conditions, such as public health crises.

Q10.a. Explain the importance of IPR in recent times.

Intellectual Property Rights (IPR) have become increasingly important in recent times due to several reasons:

1. **Knowledge-based economy:** The modern economy is driven by knowledge, innovation, and creativity. IPR protection enables individuals and businesses to capitalize on their intellectual assets, such as patents, trademarks, copyrights, and trade secrets.
2. **Globalization and competition:** With the rise of globalization, businesses face intense competition in the global market. IPR protection helps companies to differentiate themselves, protect their brand identity, and maintain a competitive edge.
3. **Innovation and R&D:** IPR encourages innovation and research and development (R&D) by providing a framework for inventors and creators to protect their work and reap the benefits of their investments.
4. **Economic growth:** IPR protection can contribute significantly to a country's economic growth by attracting foreign investment, promoting entrepreneurship, and creating jobs.
5. **Digital age:** The digital age has made it easier to create, distribute, and access intellectual property. However, it has also increased the risk of piracy, counterfeiting, and copyright infringement. IPR protection is essential to prevent these illegal activities.

6. **Brand reputation and trust:** IPR protection helps to build and maintain a company's brand reputation and trust among customers. It ensures that the brand's intellectual property is not misused or misrepresented.
7. **Encourages creativity:** IPR protection encourages creators to produce original work, knowing that their intellectual property will be protected and rewarded.
8. **Protection of traditional knowledge:** IPR protection also helps to preserve traditional knowledge and cultural heritage by preventing unauthorized use and misappropriation.
9. **Enforcement and dispute resolution:** IPR protection provides a framework for enforcing intellectual property rights and resolving disputes through legal means, which helps to maintain a stable business environment.
10. **International cooperation:** IPR protection facilitates international cooperation and collaboration by providing a common framework for protecting intellectual property across borders.

In recent times, the importance of IPR has been highlighted by various international agreements, such as the World Trade Organization's (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), which sets minimum standards for IPR protection and enforcement.

In summary, IPR protection is crucial in today's knowledge-based economy, as it encourages innovation, creativity, and entrepreneurship, while also promoting economic growth, brand reputation, and international cooperation.

b. Discuss the salient features of Copyright Act 1957.

The Copyright Act 1957 is a significant legislation in India that protects original literary, dramatic, musical, and artistic works. Here are the salient features of the Copyright Act 1957:

1. **Definition of Copyright:** The Act defines copyright as the exclusive right to do or authorize others to do certain acts in respect of a work, such as reproduction, adaptation, and communication to the public.
2. **Types of Works Protected:** The Act protects the following types of works: * Literary works (e.g., books, articles, poems) * Dramatic works (e.g., plays, scripts) * Musical works (e.g., compositions, songs) * Artistic works (e.g., paintings, sculptures, photographs) * Cinematograph films (e.g., movies, videos) * Sound recordings (e.g., music, podcasts)
3. **Ownership of Copyright:** The author of a work is the first owner of the copyright. However, in cases where the work is created during the course of employment, the employer is the owner of the copyright.
4. **Duration of Copyright:** The duration of copyright varies depending on the type of work: * Literary, dramatic, and musical works: 60 years from the author's death * Artistic works: 60 years from the date of publication * Cinematograph films: 60 years from the date of publication * Sound recordings: 60 years from the date of publication

5. Rights of Copyright Owner: The copyright owner has the exclusive right to: * Reproduce the work * Adapt the work * Communicate the work to the public * Make copies of the work * Distribute copies of the work

6. Infringement of Copyright: The Act provides for civil and criminal remedies in case of copyright infringement, including damages, injunctions, and imprisonment.

7. Fair Dealing: The Act permits fair dealing with copyrighted works for purposes such as research, criticism, review, and news reporting.

8. Registration of Copyright: While registration is not mandatory, it is recommended to register the work with the Copyright Office to establish proof of ownership and to facilitate legal action in case of infringement.

9. International Copyright Protection: The Act provides for international copyright protection under the Berne Convention and the Universal Copyright Convention.

10. Amendments: The Act has undergone several amendments, including the Copyright (Amendment) Act 2012, which introduced provisions for digital rights management, statutory licensing, and protection of performers' rights.

In summary, the Copyright Act 1957 provides a comprehensive framework for protecting original literary, dramatic, musical, and artistic works in India, and its provisions have been updated over time to address emerging issues in the digital age.