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Internal Assessment Test 2 – April 2023

Sub:	Research Methodology & IPR						Sub Code:	22RMI18	
Date:	24-4-2023	Duration:	90 min's	Max Marks:	50	Sem:	II	Branch:	MCA

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

PART I		MARKS	OBE	
			CO	RBT
1	Explain what is meant by a research problem? Explain how is it selected and formulated.	10	CO1	L1
OR				
2	List and explain the various steps involved conducting a research review.	10	CO1	L1
PART II				
3	Discuss the techniques involved in defining a research problem.	10	CO2	L2
OR				
4	Discuss the basis of stratification to be employed in sampling public opinion on inflation.	10	CO4	L2

PART III				
5	Discuss in detail the various informal experimental designs.	10	CO3	L4
OR				
6	What is research design? Explain the features of good design	10	CO1	L3
PART III				
7	Explain what is meant by sampling. List and discuss the various sampling techniques	10	CO2	L2
OR				
8	Explain the meaning of the following in context of Research design. (a) Extraneous variables; (b) Confounded relationship; (c) Research hypothesis; (d) Experimental and Control groups; (e) Treatments	10	CO2	L2
PART V				
9	How to review the literature. Demonstrate.	10	CO4	L5
OR				
10	How to Develop conceptual framework using literature review for research. Explain	10	CO4	L4

1. Explain what is meant by a research problem? Explain how is it selected and formulated.

Ans: A research problem is a statement about an area of concern, a condition to be improved, a difficulty to be eliminated, or a troubling question that exists in scholarly literature, in theory, or in practice that points to the need for meaningful understanding and deliberate investigation.

Selecting the problem:

- (i) Subject which is overdone should not be normally chosen, for it will be a difficult task to throw any new light in such a case.
- (ii) Controversial subject should not become the choice of an average researcher.
- (iii) Too narrow or too vague problems should be avoided.
- (iv) The subject selected for research should be familiar and feasible so that the related research material or sources of research are within one's reach.
- (v) The importance of the subject, the qualifications and the training of a researcher, the costs involved, the time factor are few other criteria that must also be considered in selecting a problem.
- (vi) The selection of a problem must be preceded by a preliminary study

Formulate the problem:

- i. Specify your research objectives
- ii. Review its context or environment
- iii. Explore its nature
- iv. Determine variable relationships
- v. Anticipate the possible consequences of alternative approaches.

2. List and explain the various steps involved conducting a research review

There are four steps involved in conducting a literature review:

1. Searching for the existing literature in your area of study.
2. Reviewing the selected literature.
3. Developing a theoretical framework.
4. Developing a conceptual framework.

Searching for the existing literature

To search effectively for the literature in your field of enquiry, it is imperative that you have at least some idea of the broad subject area and of the problem you wish to investigate, in order to set parameters for your search. Next, compile a bibliography for this broad area. There are three sources that you can use to prepare a bibliography:

- (a) books
- (b) journals
- (c) the Internet

Reviewing the selected literature

Now that you have identified several books and articles as useful, the next step is to start reading them critically to pull together themes and issues that are of relevance to your study. Unless you have a theoretical framework of themes in mind to start with, use separate sheets of paper for each theme or issue you identify as you go through selected books and articles.

Developing a theoretical framework

The information obtained from different books and journals now needs to be sorted under the main themes and theories, highlighting agreements and disagreements among the authors and identifying the unanswered questions or gaps. You will also realise that the literature deals with a number of aspects that have a direct or indirect bearing on your research topic. Use these aspects as a basis for developing your theoretical framework.

Developing a conceptual framework

The conceptual framework is the basis of your research problem. It stems from the theoretical framework and usually focuses on the section(s) which become the basis of your study. Whereas the theoretical framework consists of the theories or issues in which your study is embedded, the conceptual framework describes the aspects you selected from the theoretical framework to become the basis of your enquiry.

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3. Discuss the techniques involved in defining a research problem.

Ans: The various techniques involved in defining a research problem are as follows :-

(i) Statement of the problem in a general way: The research problem needs to deal with either a particular practical operational issue or some scientific discovery. It may also be related to satisfaction or widening of a certain intellectual curiosity. No matter what the subject of research, the problem definition should in general be at a logical level. For this reason, the investigator should involve himself thoroughly in the topic relating to which he wants to pose a problem.

(ii) Understanding the nature of the problem: The next step in defining the problem is that the investigator should be aware of the cause and character of the problem in clear terms via discussions and study of the environment within which problem is to be solved.

(iii) Surveying the available literature: All accessible literature in connection with the issue at hand must necessarily be surveyed and examined before a definition of the research problem is provided. It helps a professional to take a look at current dimensions in that specific area and results in enhancement of knowledge.

(iv) Developing the ideas through discussions: Discussion related to a difficulty usually produces valuable information. People who have understanding or have rich experience in the area of research have turned out to be excellent sounding board for an investigator. Their suggestions and comment on research proposal help a researcher to get greater clarity and focus on his research topic.

(v) Rephrasing the research problem: Quite often, a problem redefinition takes place when the steps mentioned above are carried out. Researcher often redefines the problem in a fashion that is more practical and logical for the conduct of the research in hand. This effort will also help with defining hypothesis

4. Discuss the basis of stratification to be employed in sampling public opinion on inflation.

The following three questions are highly relevant in the context of stratified sampling:

(a) How to form strata?

(b) How should items be selected from each stratum?

(c) How many items be selected from each stratum or how to allocate the sample size of each stratum?

Regarding the third question, we usually follow the method of proportional allocation under which the sizes of the samples from the different strata are kept proportional to the sizes of the strata. That is, if P_i represents the proportion of population included in stratum i , and n represents the total sample size, the number of elements selected from stratum i is $n \cdot P_i$. To illustrate it, let us suppose that we want a sample of size $n = 30$ to be drawn from a population of size $N = 8000$ which is divided into three strata of size $N_1 = 4000$, $N_2 = 2400$ and $N_3 = 1600$. Adopting proportional allocation, we shall get the sample sizes as under for the different strata:

For strata with $N_1 = 4000$, we have $P_1 = 4000/8000$ and hence $n_1 = n \cdot P_1 = 30 (4000/8000) = 15$

Similarly, for strata with $N_2 = 2400$, we have $n_2 = n \cdot P_2 = 30 (2400/8000) = 9$,

and for strata with $N_3 = 1600$, we have $n_3 = n \cdot P_3 = 30 (1600/8000) = 6$.

Thus, using proportional allocation, the sample sizes for different strata are 15, 9 and 6 respectively which is in proportion to the sizes of the strata viz., 4000 : 2400 : 1600.

$$n_1/N_1\sigma_1 = n_2/N_2\sigma_2 = \dots\dots\dots = n_k/N_k\sigma_k$$

where $\sigma_1, \sigma_2, \dots$ and σ_k denote the standard deviations of the k strata, N_1, N_2, \dots, N_k denote the sizes of the k strata and n_1, n_2, \dots, n_k denote the sample sizes of k strata. This is called '*optimum allocation*' in the context of disproportionate sampling. The allocation in such a situation results in the following formula for determining the sample sizes different strata:

$$n_i = \frac{n \cdot N_i \sigma_i}{N_1 \sigma_1 + N_2 \sigma_2 + \dots + N_k \sigma_k} \quad \text{for } i = 1, 2, \dots \text{ and } k.$$

A population is divided into three strata so that $N_1 = 5000, N_2 = 2000$ and $N_3 = 3000$. Respective standard deviations are:

$$\sigma_1 = 15, \sigma_2 = 18 \text{ and } \sigma_3 = 5.$$

How should a sample of size $n = 84$ be allocated to the three strata, if we want optimum allocation using disproportionate sampling design?

5. Discuss in detail the various informal experimental designs.

Example to be given as discussed in the class

Various Informal experimental designs:

- A. Before-and-after without control design.
- B. After-only with control design.
- C. Before-and-after with control design.
- D. 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.

A) 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.

c) Before-and-after with control design

Two areas are selected and the dependent variable is measured in both the areas for an identical time-period 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.

6. What is research design? Explain the features of good design.

A Research Design is simply a structural framework of various research methods as well as techniques that are utilized by a researcher. The research design helps a researcher to pursue their journey into the unknown but with a systematic approach by their side. The way an engineer or architect frames a design for a structure, likewise the researcher picks the design from various approaches in order to check which type of research to be carried out.

- (i) What is the study about?
- (ii) Why is the study being made?
- (iii) Where will the study be carried out?
- (iv) What type of data is required?
- (v) Where can the required data be found?
- (vi) What periods of time will the study include?
- (vii) What will be the sample design?
- (viii) What techniques of data collection will be used?
- (ix) How will the data be analyzed?
- (x) In what style will the report be prepared?

The sampling design which deals with the method of selecting items to be observed for the given study.

The observational design which relates to the conditions under which the observations are to be made;

The statistical design which concerns with the question of how many items are to be observed and how the information and data gathered are to be analyzed; and

The operational design which deals with the techniques by which the procedures specified in the sampling, statistical and observational designs can be carried out.

Research design is needed because it facilitates the smooth sailing of the various research operations, thereby making research as efficient as possible yielding maximal information with minimal expenditure of effort, time and money.

Some features of good design are:

- The means of obtaining information.
- The availability and skills of the researcher and his staff, if any.
- The objective of the problem to be studied.
- The nature of the problem to be studied; and,
- The availability of time and money for the research work.

7. Explain what is meant by sampling. List and discuss the various sampling techniques.

Meaning of Sampling:

In research terms a sample is a group of people, objects, or items that are taken from a larger population for measurement. The sample should be representative of the population to ensure that we can generalise the findings from the research sample to the population as a whole.

Sampling errors

Sampling errors are the random variations in the sample estimates around the true population parameters. Sampling error decreases with the increase in the size of the sample, and it happens to be of a smaller magnitude in case of homogeneous population. Sampling error can be measured for a given sample design and size. The measurement of sampling error is usually called the 'precision of the sampling plan'. If we increase the sample size, the precision can be improved. But increasing the size of the sample has its own limitations viz., a large sized sample increases the cost of collecting data and also enhances the systematic bias. Thus the effective way to increase precision is usually to select a better sampling design which has a smaller sampling error for a given sample size at a given cost.

CHARACTERISTICS OF A GOOD SAMPLE DESIGN:

- (a) Sample design must result in a truly representative sample.
- (b) Sample design must be such which results in a small sampling error.
- (c) Sample design must be viable in the context of funds available for the research study.
- (d) Sample design must be such so that systematic bias can be controlled in a better way.
- (e) Sample should be such that the results of the sample study can be applied, in general, for the universe with a reasonable level of confidence.

There are two types of sampling methods:

I. Probability sampling involves random selection, allowing you to make strong statistical inferences about the whole group.

II. Non-probability sampling involves non-random selection based on convenience or other criteria, allowing you to easily collect data.

I. Probability sampling methods:

Probability sampling means that every member of the population has a chance of being selected. It is mainly used in quantitative research. If you want to produce results that are representative of the whole population, probability sampling techniques are the most valid choice.

1. Simple Random Sampling:

In a simple random sample, every member of the population has an equal chance of being selected. Your sampling frame should include the whole population. To conduct this type of sampling, you can use tools like random number generators or other techniques that are based entirely on chance.

Example:

You want to select a simple random sample of 100 employees of Company X. You assign a number to every employee in the company database from 1 to 1000, and use a random number generator to select 100 numbers.

2. Systematic sampling:

Systematic sampling is similar to simple random sampling, but it is usually slightly easier to conduct. Every member of the population is listed with a number, but instead of randomly generating numbers, individuals are chosen at regular intervals.

Example

All employees of the company are listed in alphabetical order. From the first 10 numbers, you randomly select a starting point: number 6. From number 6 onwards, every 10th person on the list is selected (6, 16, 26, 36, and so on), and you end up with a sample of 100 people.

3. Stratified sampling:

Stratified sampling involves dividing the population into subpopulations that may differ in important ways. It allows you draw more precise conclusions by ensuring that every subgroup is properly represented in the sample. To use this sampling method, you divide the population into subgroups (called strata) based on the relevant characteristic (e.g. gender, age range, income bracket, job role).

Example:

The company has 800 female employees and 200 male employees. You want to ensure that the sample reflects the gender balance of the company, so you sort the population into two strata based on gender. Then you use random sampling on each group, selecting 80 women and 20 men, which gives you a representative sample of 100 people.

4. Cluster sampling:

Cluster sampling also involves dividing the population into subgroups, but each subgroup should have similar characteristics to the whole sample. Instead of sampling individuals from each subgroup, you randomly select entire subgroups. This method is good for dealing with large and dispersed populations, but there is more risk of error in the sample, as there could be substantial differences between clusters. It's difficult to guarantee that the sampled clusters are really representative of the whole population.

Example:

The company has offices in 10 cities across the country (all with roughly the same number of employees in similar roles). You don't have the capacity to travel to every office to collect your data, so you use random sampling to select 3 offices – these are your clusters.

II. Non probability sampling:

In a non-probability sample, individuals are selected based on non-random criteria, and not every individual has a chance of being included. This type of sample is easier and cheaper to access, but it has a higher risk of sampling bias. Non-probability sampling techniques are often used in exploratory and qualitative research.

1. Convenience sampling:

A convenience sample simply includes the individuals who happen to be most accessible to the researcher. This is an easy and inexpensive way to gather initial data, but there is no way to tell if the sample is representative of the population, so it can't produce generalizable results.

Example:

You are researching opinions about student support services in your university, so after each of your classes, you ask your fellow students to complete a survey on the topic. This is a convenient way to gather data, but as you only surveyed students taking the same classes as you at the same level, the sample is not representative of all the students at your university.

2. Voluntary response sampling:

Similar to a convenience sample, a voluntary response sample is mainly based on ease of access. Instead of the researcher choosing participants and directly contacting them, people volunteer themselves (e.g. by responding to a public online survey). Voluntary response samples are always at least somewhat biased, as some people will inherently be more likely to volunteer than others.

Example:

You send out the survey to all students at your university and a lot of students decide to complete it. This can certainly give you some insight into the topic, but the people who responded are more likely to be those who have strong opinions about the student support services, so you can't be sure that their opinions are representative of all students.

3. Purposive sampling:

This type of sampling, also known as judgement sampling, involves the researcher using their expertise to select a sample that is most useful to the purposes of the research. It is often used in qualitative research, where the researcher wants to gain detailed knowledge about a specific phenomenon rather than make statistical inferences, or where the population is very small and specific. An effective purposive sample must have clear criteria and rationale for inclusion.

Example:

You want to know more about the opinions and experiences of disabled students at your university, so you purposefully select a number of students with different support needs in order to gather a varied range of data on their experiences with student services.

4. Snowball sampling:

If the population is hard to access, snowball sampling can be used to recruit participants via other participants. The number of people you have access to "snowballs" as you get in contact with more people.

Example:

You are researching experiences of homelessness in your city. Since there is no list of all homeless people in the city, probability sampling isn't possible. You meet one person who agrees to participate in the research, and she puts you in contact with other homeless people that she knows in the area.

8. Explain the meaning of the following in context of Research design.

(a) Extraneous variables; (b) Confounded relationship; (c) Research hypothesis; (d) Experimental and Control groups; (e) Treatments.

Answer:

a) Extraneous Variables:-

Independent variables that are not related to the purpose of the study, but may affect the dependent variable are termed as extraneous variables. Suppose the researcher wants to test the hypothesis that there is a relationship between children's gains in social studies achievement and their self-concepts. In this case self-concept is an independent variable and social studies achievement is a dependent variable. Intelligence may as well affect the social studies achievement, but since it is not related to the purpose of the study undertaken by the researcher, it will be termed as an extraneous variable. Whatever effect is noticed on dependent variable as a result of extraneous variable(s) is technically described as an 'experimental error'. A study must always be so designed that the effect upon the dependent variable is attributed entirely to the independent variable(s), and not to some extraneous variable or variables.

b) Confounded Relationship:-

When the dependent variable is not free from the influence of extraneous variable's, the relationship between the dependent and independent variables is said to be confounded by an extraneous variable.

c) Research Hypothesis: -

When a prediction or a hypothesised relationship is to be tested by scientific methods, it is termed as research hypothesis. The research hypothesis is a predictive statement that relates an independent variable to a dependent variable. Usually a research hypothesis must contain, at least, one independent and

one dependent variable. Predictive statements which are not to be objectively verified or the relationships that are assumed but not to be tested, are not termed research hypotheses.

d) Experimental and control groups: -

In experimental hypothesis-testing research when a group is exposed to usual conditions, it is termed a 'control group', but when the group is exposed to some novel or special condition, it is termed an 'experimental group'. The Group A of 25 students can be called a control group and the Group B of 25 students an experimental group. If both groups A and B are exposed to special studies programmes, then both groups would be termed 'experimental groups.' It is possible to design studies which include only experimental groups or studies which include both experimental and control groups.

e) Treatments: -

The different conditions under which experimental and control groups are put are usually referred to as treatments. In the illustration taken above, the two treatments are the usual studies programme and the special studies programme. Similarly, if we want to determine through an experiment the comparative impact of three varieties of fertilizers on the yield of wheat, in that case the three varieties of fertilizers will be treated as three treatments.

9. How to review the literature. Demonstrate.

Ans: A **literature review** is a survey of scholarly sources on a specific topic. It provides an overview of current knowledge, allowing you to identify relevant theories, methods, and gaps in the existing research.

Writing a literature review involves finding relevant publications (such as books and journal articles), critically analyzing them, and explaining what you found. There are five key steps:

1. **Search** for relevant literature
2. **Evaluate** sources
3. **Identify** themes, debates and gaps
4. **Outline** the structure
5. **Write** your literature review

A good literature review doesn't just summarize sources—it analyzes, synthesizes, and critically evaluates to give a clear picture of the state of knowledge on the subject.

1. Search for relevant sources

Use your keywords to begin searching for sources. Some useful databases to search for journals and articles include:

- Your university's library catalogue
- Google Scholar
- JSTOR
- EBSCO
- Project Muse (humanities and social sciences)
- Medline (life sciences and biomedicine)
- EconLit (economics)
- Inspec (physics, engineering and computer science)

2. Evaluate and select sources

You probably won't be able to read absolutely everything that has been written on the topic—you'll have to evaluate which sources are most relevant to your questions.

For each publication, ask yourself:

- What question or problem is the author addressing?
- What are the key concepts and how are they defined?

- What are the key theories, models and methods? Does the research use established frameworks or take an innovative approach?
- What are the results and conclusions of the study?
- How does the publication relate to other literature in the field? Does it confirm, add to, or challenge established knowledge?
- How does the publication contribute to your understanding of the topic? What are its key insights and arguments?
- What are the strengths and weaknesses of the research?

Make sure the sources you use are credible, and make sure you read any landmark studies and major theories in your field of research.

You can find out how many times an article has been cited on Google Scholar—a high citation count means the article has been influential in the field, and should certainly be included in your literature review.

The scope of your review will depend on your topic and discipline: in the sciences you usually only review recent literature, but in the humanities you might take a long historical perspective (for example, to trace how a concept has changed in meaning over time).

3. Identify themes, debates, and gaps

To begin organizing your literature review's argument and structure, you need to understand the connections and relationships between the sources you've read. Based on your reading and notes, you can look for:

- **Trends and patterns (in theory, method or results):** do certain approaches become more or less popular over time?
- **Themes:** what questions or concepts recur across the literature?
- **Debates, conflicts and contradictions:** where do sources disagree?
- **Pivotal publications:** are there any influential theories or studies that changed the direction of the field?
- **Gaps:** what is missing from the literature? Are there weaknesses that need to be addressed?

This step will help you work out the structure of your literature review and (if applicable) show how your own research will contribute to existing knowledge.

4. Outline your literature review's structure

There are various approaches to organizing the body of a literature review. You should have a rough idea of your strategy before you start writing.

Depending on the length of your literature review, you can combine several of these strategies (for example, your overall structure might be thematic, but each theme is discussed chronologically).

➤ Chronological

The simplest approach is to trace the development of the topic over time. However, if you choose this strategy, be careful to avoid simply listing and summarizing sources in order.

Try to analyze patterns, turning points and key debates that have shaped the direction of the field. Give your interpretation of how and why certain developments occurred.

➤ Thematic

If you have found some recurring central themes, you can organize your literature review into subsections that address different aspects of the topic.

For example, if you are reviewing literature about inequalities in migrant health outcomes, key themes might include healthcare policy, language barriers, cultural attitudes, legal status, and economic access.

➤ **Methodological**

If you draw your sources from different disciplines or fields that use a variety of research methods, you might want to compare the results and conclusions that emerge from different approaches. For example:

- Look at what results have emerged in qualitative versus quantitative research
- Discuss how the topic has been approached by empirical versus theoretical scholarship
- Divide the literature into sociological, historical, and cultural sources

➤ **Theoretical**

A literature review is often the foundation for a theoretical framework. You can use it to discuss various theories, models, and definitions of key concepts.

You might argue for the relevance of a specific theoretical approach, or combine various theoretical concepts to create a framework for your research.

5. Write your literature review

Like any other academic text, your literature review should have an introduction, a main body, and a conclusion. What you include in each depends on the objective of your literature review.

➤ **Introduction**

The introduction should clearly establish the focus and purpose of the literature review.

➤ **Body**

Depending on the length of your literature review, you might want to divide the body into subsections. You can use a subheading for each theme, time period, or methodological approach.

As you write, you can follow these tips:

- **Summarize and synthesize**: give an overview of the main points of each source and combine them into a coherent whole
- **Analyze and interpret**: don't just paraphrase other researchers—add your own interpretations where possible, discussing the significance of findings in relation to the literature as a whole
- **Critically evaluate**: mention the strengths and weaknesses of your sources
- **Write in well-structured paragraphs**: use transition words and topic sentences to draw connections, comparisons and contrasts

➤ **Conclusion**

In the conclusion, you should summarize the key findings you have taken from the literature and emphasize their significance. When you've finished writing and revising your literature review, don't forget to proofread thoroughly before submitting.



10. How to develop conceptual framework using literature review for research. Explain.

Ans: DEFINITION OF CONCEPTUAL FRAMEWORK

A conceptual framework represents the researcher's synthesis of the literature on how to explain a phenomenon. It maps out the actions required in the course of the study, given his previous knowledge of other researchers' point of view and his observations on the subject of research.

In other words, the conceptual framework is the researcher's understanding of how the particular **variables** in his study connect. Thus, it identifies the variables required in the research investigation. It is the researcher's "map" in pursuing the investigation.

4 STEPS ON HOW TO MAKE THE CONCEPTUAL FRAMEWORK

Before you prepare your conceptual framework, you need to do the following things:

➤ CHOOSE YOUR TOPIC

Decide on what will be your research topic. The topic should be within your field of specialization. (Generate your research topic using **brainstorming tips**).

➤ DO A LITERATURE REVIEW

Review relevant and updated research on the theme that you decide to work on after scrutiny of the issue at hand. Preferably use **peer-reviewed**, and well-known scientific journals as these are reliable sources of information.

➤ ISOLATE THE IMPORTANT VARIABLES

Identify the specific variables described in the literature and figure out how these are related. Some research **abstracts** contain the variables, and the salient findings thus may serve the purpose. If these are not available, find the research paper's summary.

If the variables are not explicit in summary, get back to the methodology or the results and discussion section and quickly identify the study variables and the significant findings.

➤ GENERATE THE CONCEPTUAL FRAMEWORK

Build your conceptual framework using your mix of the variables from the scientific articles you have read. Your problem statement or **research objective** serves as a reference for constructing it. In effect, your study will attempt to answer the question that other researchers have not explained yet. Your research should address a **knowledge gap**.
