

**M. Com (Third Semester) Examination, 2013**

**Paper Title: Research Methodology**

**Paper Code: AS-2375**

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**Note: These model answers are a depiction of important points which an examinee must have to mention to secure high marks in particular question. The length of the answer may vary as per the examinee's understanding, interpretation and his/her ability to comprehend the content.**

**Ans.1 Short Answer Type Questions**

**(i) Explanatory Research:** Investigation into a problem or situation which provides insights to the researcher. The research is meant to provide details where a small amount of information exists. Explanatory research attempts to clarify why and how there is a relationship between two aspects of a situation or phenomenon. This type of research attempts to explain, for example, why stressful living results in heart attacks; why a decline in mortality is followed by fertility decline; or how the home environment affects children's level of academic achievement.

**(ii) Qualitative research:** Qualitative research deals with phenomena that are difficult or impossible to quantify mathematically, such as beliefs, meanings, attributes, and symbols. Qualitative research is especially important in the behavioral sciences where the aim is to discover the underlying motives of human behaviour. Through such research we can analyze the various factors which motivate people to behave in a particular manner or which make people like or dislike a particular thing.

**(iii) Difference between Null and Alternate hypothesis:** A research hypothesis is an assertion about a particular phenomenon that is, typically, derived from a theory. For example, we might assert that a particular independent variable will have an effect on a dependent measure. The research hypothesis (usually indicated by the symbol  $H_1$ ). The null hypothesis (usually indicated

by the symbol  $H_0$ ) is the statement that the treatment manipulation will not have any effect - that there is zero effect due to the independent variable. A null hypothesis is "the hypothesis that there is no relationship between two or more variables. The alternate, or research, hypothesis proposes a relationship between two or more variables.

**(iv) Need of Research Design:** Research design acts as a firm foundation for the entire research. It is needed because it facilitates the smooth functioning of the various research operations. It makes the research as efficient as possible by giving maximum information with minimal expenditure of effort, time and money. For construction of a house, we need to have a proper blueprint prepared by an expert architect. Similarly, we need a proper research design or plan prior to data collection and analysis of our research project.

**(v) Schedule Method:** A schedule is a structure of set of questions on a given topic which are asked by the interviewer or investigator personally. The order of questions, the language of the questions and the arrangement of parts of the schedule are not changed. However, the investigator can explain the questions if the respondent faces any difficulty. Schedule include open-ended questions and close-ended questions. Open-ended questions allow the respondent considerable freedom in answering. However, questions are answered in details. Close-ended questions have to be answered by the respondent by choosing an answer from the set of answers given under a question just by ticking.

**(vi) Random Sampling:** For a sampling design to be called a random or probability sample, it is imperative that each element in the population has an equal and independent chance of selection in the sample. The choice of an element in the sample is not influenced by other considerations such as personal preference. The choice of one element is not dependent upon the choice of another element in the sampling. The selection or rejection of one element does not affect the inclusion or exclusion of another.

**(vii) Disadvantage of Close ended-Questions:**

- respondents with no opinion or no knowledge can answer anyway
- Close-ended questions, because of the simplicity and limit of the answers, may not offer the respondents choices that actually reflect their real feelings.

- One of the main disadvantages of closed-ended questions is that the information obtained through them lacks depth and variety.
- There is a greater possibility of investigator bias because the researcher may list only the response patterns that s/he is interested in or those that come to mind.

**(viii) Interpretation:** Interpretation refers to the task of drawing inferences from the collected facts after an analytical and/or experimental study. In fact it is a search for broader meaning of research findings. The usefulness and utility of research findings lie in proper interpretation.

**(ix) After-only Design:** In an after-only design the researcher knows that a population is being, or has been, exposed to an intervention and wishes to study its impact on the population. In this design, information on baseline is usually 'constructed' on the basis of respondents' recall of the situation before the intervention, or from information available in existing records. This design is widely used in impact assessment studies, as in real life many programs operate without the benefit of a planned evaluation at the program planning stage.

(x) Let us take the hypothesis that male and female babies are born in equal number, i.e.,  $P = 1/2$

$$S.E. = \sqrt{N P Q} = \sqrt{1000 \times \frac{1}{2} \times \frac{1}{2}} = 15.81$$

Difference between observed and expected number of female babies =  $520 - 500 = 20$

$$\frac{\text{Difference}}{S.E.} = \frac{20}{15.81} = 1.265$$

Since the difference is less than 1.96 S.E. (5% level) it can be concluded that the male and female babies are born in equal number.

**Ans.2** 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. In some social science disciplines the research problem is typically posed in the form of a question.

**Steps in the Formulation of Research Problem:**

- Identify a broad field or subject area of interest to you
- Dissect the broad area into subareas
- Select what is of most interest to you
- Raise research question
- Formulate objectives
- Access your objectives
- Double-check

**[Proper explanation of the points is required]**

**Ans. 3 (i) Limitations of test of significance:** There are several limitations of the said tests which should always be borne in mind by a researcher. Important limitations are as follows:

- The tests should not be used in a mechanical fashion. It should be kept in view that testing is not decision-making itself; the tests are only useful aids for decision-making. Hence “proper interpretations of statistical evidence is important to intelligent decisions.
- Tests do not explain the reasons as to why does the difference exist, say between the means of the two samples. They simply indicate whether the difference is due to fluctuations of sampling or because of other reasons but the tests do not tell us as to which is/are the other reason(s) causing the difference.
- Results of significance are based on probabilities and as such cannot be expressed with full certainty. When a test shows that a difference is statistically significant, then it simply suggests that the difference is probably not due to chance.
- Statistical inferences based on the significance tests cannot be said to be entirely correct evidences concerning the truth of the hypotheses. This is specially so in case of small samples where the probability of drawing erring inferences happens to be generally higher. For greater reliability, the size of samples be sufficiently enlarged.

All these limitations suggest that in problems of statistical significance, the inference techniques (or the tests) must be combined with adequate knowledge of the subject-matter along with the ability of good judgment.

**Ans. 3 (ii) Type I error:** Rejecting the *null* hypothesis when it is in fact true is called a ***Type I error***. Many people decide, before doing a hypothesis test, on a maximum p-value for which they will reject the null hypothesis. This value is often denoted  $\alpha$  (alpha) and is also called the ***significance level***.

**Type II Error:** Not rejecting the null hypothesis when in fact the *alternate* hypothesis is true is called a ***Type II error***.

**The following Table summarizes Type I and Type II Errors:**

	Null Hypothesis (Ho) True	Null Hypothesis (Ho) False
Reject Null Hypothesis	<i>Type I Error</i>	<i>Correct Decision</i>
Fail to reject Null Hypothesis	<i>Correct Decision</i>	<i>Type II Error</i>

With a fixed sample size, n, when we try to reduce type I error, the probability of committing Type II error increases. Both types of errors can't be reduced simultaneously. There is a trade-off between these two types of errors which means that the probability of making one type of error can only be reduced if we are willing to increase the probability of making the other type of error.

**For example:** The null hypothesis is "**defendant is guilty;**" the alternate is "**defendant is not guilty.**" A Type II error would correspond to convicting an innocent person; a Type I error would correspond to setting a guilty person free. This has been shown in the table given below:

		Truth	
		Guilty	Not Guilty
Judgment	Not Guilty	Type I Error -- Guilty person goes free	<i>Correct Decision</i>
	Guilty	<i>Correct Decision</i>	Type II Error -- Innocent person goes to jail.

Here in this example **type II** error is very serious from the point of view of Indian system of justice. But **type I** error is dangerous from the point of view of the safety of the country as well as society as the victim will move freely in the society. So precision level should be decided by taking into consideration both the angles of a decision.

**Ans. 4 Research Design:** Research design is a blue print or detailed plan for how a research study is to be completed-operationalizing variables so they can be measured, selecting a sample of interest to study, collecting data to be used as a basis for testing hypotheses, and analyzing the results.

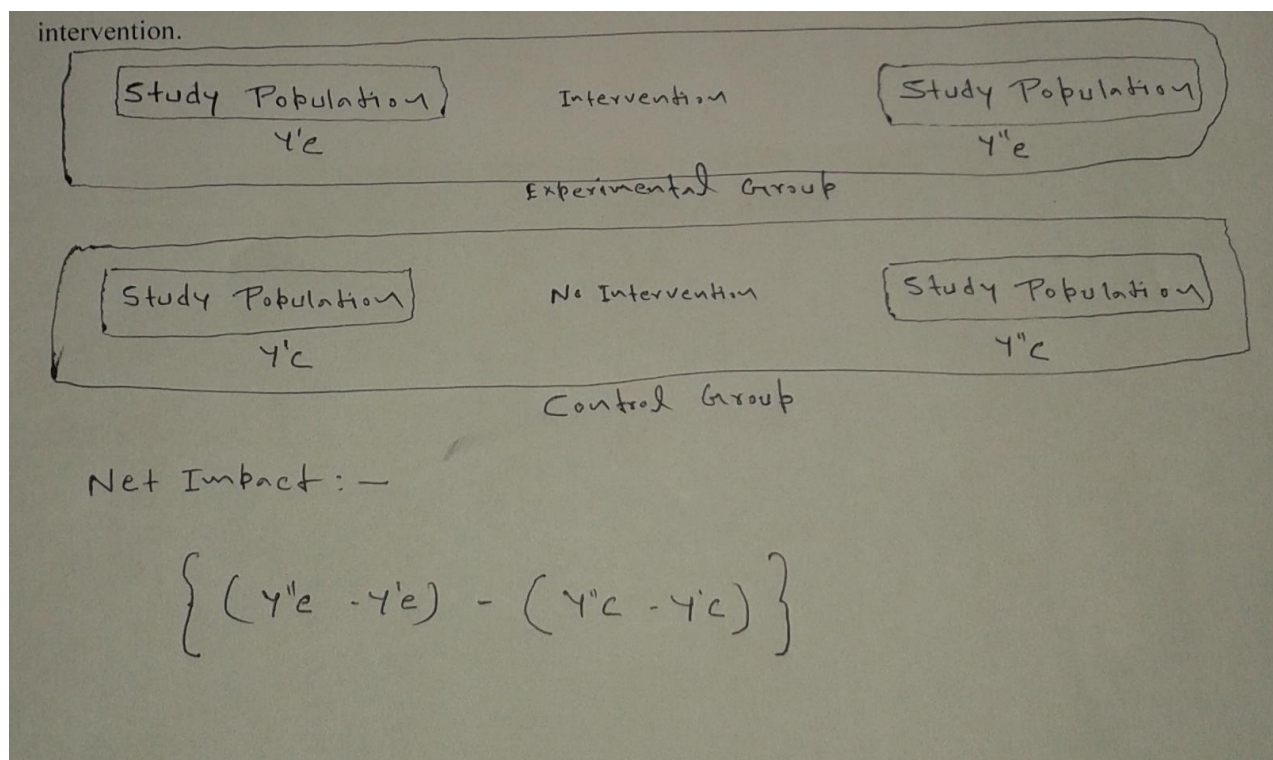
**Experimental Study:** The research study in which researcher introduces the intervention that is assumed to be the ‘cause’ of change, and waiting until it has produced-or has been given sufficient time to produce-the change, is called an experimental study. Some of the important experimental study designs are as follow:

**After-only Design:** In an after-only design the researcher knows that a population is being, or has been, exposed to an intervention and wishes to study its impact on the population. In this design, information on baseline is usually ‘constructed’ on the basis of respondents’ recall of the situation before the intervention, or from information available in existing records. This design is widely used in impact assessment studies, as in real life many programs operate without the benefit of a planned evaluation at the program planning stage.

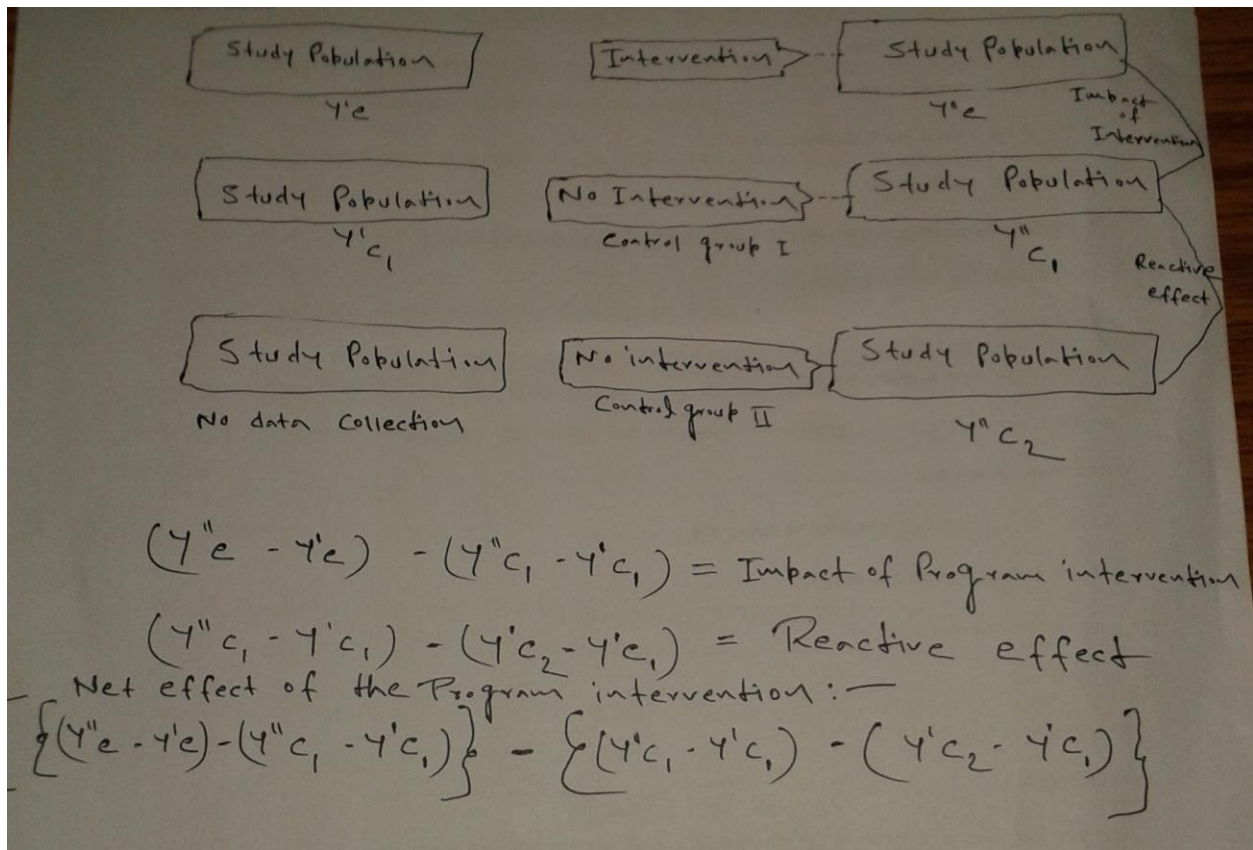
**The before-and-after design:** The before-and-after design overcomes the problem of retrospectively constructing the ‘before’ observation by establishing it before the intervention is introduced to the study population. Then, when the program has been completely implemented or is assumed to have had its effect on the population, the ‘after’ observation is carried out to ascertain the impact attributable to the intervention. The impact of the intervention in before-and-after design is calculated as follows:

**[Change in dependent variable]** = [status of the dependent variable at the 'after' observation] – [status of the dependent variable at the 'before' observation]

**The Control-group design:** In a study utilizing the control-group design the researcher selects two population groups instead of one: a control group and an experimental group. These groups are expected to be comparable as far as possible in every respect except the intervention. The experimental group either receives or is exposed to the intervention, whereas the control is not. First, the 'before' observations are made on both groups at the same time. The experimental group is then exposed to the intervention. When it is assumed that the intervention has had an impact, an 'after' observation is made on both groups. Any difference in the 'before' and 'after' observations between the groups regarding the dependent variable(s) is attributed to the intervention.



**The Double-control Design:** Although the control-group design helps the researcher to quantify the impact that can be attributed to extraneous variables, it does not separate out other effects that may be due to the research instrument (such as the reactive effect). When the researcher needs to identify and separate out this effect, a double control design is required. In a double-control study, the researcher has two control groups instead of one. To quantify, say, the reactive effect of an instrument, the researcher excludes one of the control groups from the 'before' observation.



**Ans. 5** Several methods can be used to gathering information about a situation, person, Problem or phenomenon. The choice of a method depends upon the purpose of the study, the resources available and the skills of the researcher. In selecting a method of data collection, the socioeconomic-demographic characteristics of the study population play an important role. If possible, it is helpful to know the study population's interest in, and attitude towards, participation in the study. Some effective and commonly used methods of data collection are as follow:



- **Observation:** Observation is a purposeful, systematic and selective way of watching and listening to an interaction or phenomenon as it takes place. There are many situations in which observation is the most appropriate method of data collection; for example, when you want to learn about the interaction in a group study the dietary patterns of a population, ascertain the functions performed by a worker, or the behaviour or personality traits of an individual.
- **The interview:** Interviewing is a commonly used method of collecting information from people. Any person-to-person interaction between two or more individuals with a specific purpose in mind is called an interview. On the one hand, interviewing can be very flexible, when the interviewer has the freedom to formulate questions as they come to mind around the issue being investigated; and on the other hand, it can be inflexible, when the investigator has to keep strictly to the questions decided beforehand.
- **The Schedule:** This method of data collection is very much like the collection of data through questionnaire, with little difference which lies in the fact that schedules (Performa containing a set of questions) are being filled in by the enumerators who are specially appointed for the purpose. These enumerators along with schedules go to the respondents, put to them the questions from the Performa in the order the questions are listed and record the replies in the space meant for the same in the Performa. The enumerators should be trained to perform their job well and the nature and scope of the investigation should be explained to them thoroughly so that they may well understand the implications of different questions put in the schedule.
- **The Questionnaire:** A questionnaire is a written list of questions, the answers to which are recorded by respondents. In a questionnaire respondents read the questions, interpret what is expected and then write down the answers. The only difference between an interview schedule and a questionnaire is that in the former it is the interviewer who asks the questions (and if necessary, explains them) and records the respondent's replies on an interview schedule and in the latter replies are recorded by the respondents themselves.

### **Essentials of a good Questionnaire:**

- In the case of questionnaire, as there is no one to explain the meaning of questions to respondents, it is important that questions are clear and easy to understand.
- The layout of a questionnaire should be such that should be easy to read and pleasant to the eye.
- The sequence of the questions should be easy to follow.
- A questionnaire should be developed in an interactive style. This means respondents should feel as if someone is talking to them.
- In a questionnaire, a sensitive question or a question respondents may feel hesitant about answering should be prefaced by an interactive statement explaining the relevance of the question.
- Covering letter of the questionnaire should introduce the respondents with the institution and objective of the research.
- Respondents should be assured of the anonymity of the information provided by them;
- Not forget to convey special thanks to the respondents for their participation.

**Ans. 6** Having decided what you want to study about, the next question is: How are you going to conduct your study? What procedure will you adopt to obtain answers to research questions? How will you carry out the tasks needed to complete the different components of the research process? What should you do and what should you not do in the process of undertaking the study? These are some of the questions that need to be answered before you can proceed with the study. Basically answers to these questions constitute the core of a research design.

“A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems. The plan is the complete scheme or program of the research. It includes an outline of what the investigator will do from writing the hypotheses and their operational implications to the final analysis of data.”

**Components of Research Design:** The length and complexity of research designs can vary considerably, but any sound design will do the following things:

1. Identify the research problem clearly and justify its selection,
2. Review previously published literature associated with the problem area,
3. Clearly and explicitly specify hypotheses [tentative answers] to the problem selected,
4. Effectively describe the data which will be necessary for an adequate test of the hypotheses and explain how such data will be obtained, and
5. Describe the methods of analysis which will be applied to the data in determining whether the hypotheses are true or false.

### **Factors affecting Research Design**

- Availability of sufficient information
- Availability of Data
- Time availability
- Proper exposure to the data source
- Availability of the money
- Manpower availability
- Magnitude of the problem
- Ability, knowledge, skill, technical understanding and technical background of the researcher
- Controllable variables
- Un-controllable variables
- Internal variables
- External variables

**Ans. 7** The research and its adequacy are examined on the basis of research proposal, research summary, research abstract and the research report. The contribution of the study is judged on the basis of research report. Research report is considered a major component of the research study for the research task remains incomplete still the report has been presented and/or written.

As a matter of fact even the most brilliant hypothesis, highly well designed and conducted research study, and the most striking generalizations and findings are of little value unless they

are effectively communicated to others. The purpose of research is not well served unless the findings are made known to others. Good researcher should always treat the presentation of research results or the writing of report as part of the research project. Writing of report is the last step in a research study and requires a set of skills somewhat different from those called for in respect of the earlier stages of research.

**Different Steps in Writing Report:** Research reports are the product of slow, painstaking, accurate inductive work. The usual steps involved in writing report are:

- Logical analysis of the subject matter
- Preparation of the final outline
- Preparation of the rough draft
- Preparation of the final bibliography
- Writing the final draft

[Proper explanation of all the points is required]

Ans. 8

Ans. Let us take the hypothesis that there is no significant difference in the mean life of bulbs in the sample and that of the population. Applying t-test:

$$t = \frac{\bar{x} - \mu}{s} \sqrt{n}$$

X	$(X - \bar{X})$	$X^2$
	+1	1
24	+3	9
26	+7	49
30	-3	9
20	-3	9
20	-5	25
18		
$\Sigma x = 138$		$\Sigma x^2 = 102$

$$\bar{X} = \frac{\Sigma x}{n} = \frac{138}{6} = 23$$

$$S = \sqrt{\frac{\Sigma x^2}{n-1}} = \sqrt{\frac{102}{5}} = \sqrt{20.4} = 4.517$$

$$= \frac{|23 - 25|}{4.517} \sqrt{6} = \frac{2 \times 2.449}{4.517} = 1.084$$

$$V = n - 1 = 6 - 1 = 5. \text{ For } v = 5, t_{0.01} = 4.032$$

The calculated value of t is less than the table value. The hypothesis is accepted. Hence the manufacturer's claim is valid at 1% level of significance.