UNIT 3 DEFINITION AND DIVISION

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3.0 OBJECTIVES

Logic deals with thought, and thoughts are always expressed in language in which different words we use are expected to convey proper idea. If there are no fixed ideas, it would be difficult to understand what one means by a word. In such a situation error and confusion will be the result. For example, a lawyer and a doctor do not define the term 'man' in the same sense. Their definitions are bound to vary. We define a term according to the interest we have in it. But logic deals with correct thinking. Our thoughts can never be correct unless we determine the meaning of each term through correct language. Each term must be understood in its proper sense. The tools which logic uses to achieve this purpose are definition and division. Therefore, the unit aims at introducing the students to:

- correct thinking
- correct language
- correct knowledge of definition and division

In the previous unit we have seen that a term may be defined in two ways:

1) by reference to its denotation and 2) by reference to its connotation. Explanation of a term is with reference to its denotation and it is known as division, and explanation of a term with reference to its connotation is known as definition. In this unit we undertake a detailed study of definition and division.

3.1 INTRODUCTION

Language is a very complicated instrument, the principal tool for human communication. But when words are used carelessly or mistakenly, what was intended to enhance mutual understanding, may, in fact hinder it. Our instrument thus becomes our burden. This can happen when the words used in a discussion are ambiguous or

emotionally loaded. True, most controversies involve much more than words, but sometimes conflict turns chiefly on and unsuspected difference in the ways the parties are using some key terms whose different senses may be equally legitimate, but must not be confused. Then it is useful to be able to specify or explain the different senses of the ambiguous term.

Definitions can effectively resolve disputes that are merely verbal by exposing and eliminating ambiguities. Definitions are essential to expose and prevent fallacies of ambiguity and reasoning. We shall begin first by examining the nature of definition.

3.2 NATURE OF DEFINITION

Classical logicians have tried to define terms. The term to be defined is called *definiendum* and its definition is called *definien.* According to them, definition aims at unfolding the meaning of a term. It is the explicit statement of complete connotation of a term. The connotation of a term consists of essential attributes of the term. The purpose of defining a term is to understand the meaning of a term. For example, while defining man, *rationality* and *animality* are the two essential qualities which are considered. Hence man is defined as a rational animal. Popularly definition is divided into two types; verbal and real definition.

The time honoured rule of definition is that it is *per genus et differentiam*, i.e., a statement of the connotation of the proximate genus and the differentia of the term. In other words while defining a term one has to state the genus and the differentia. Genus means the class and the differentia means the distinct quality unique to *definiendum* and therefore differentia means *definien.* A definition consists in stating first the class to which the *definiendum* belongs and then state the *definien.* It must be noted that this order is irreversible. In other words, in defining a term, we first of all decide to what class of things it belongs and then, we mark the attribute or group of attributes, which distinguish it from other members of that class. For example, while defining man as a rational animal, it is meant that man possesses the attributes of 'animality', belonging to its proximate genus *animal* and the differentia, *rationality*. It is the differentia because it belongs to none other than man. Similarly, when we define plane triangle as a figure bounded by three straight lines, the proximate genus is figure and the differentium is the attribute of being bounded by three straight lines.

(This view of definition is based on a presupposition that there is a highest class followed by lower classes. The highest class is known as the *summum genus* and the lowest class is known as the *infima species*. Aristotle and the medieval logicians firmly believed that the smaller class is included in the bigger class. This theory of logic of Aristotle is complementary to his theory of biology. Aristotle believed that there are natural classes; genus, species and the entire animal kingdom including the vegetative kingdom can be classified on the basis of genus- species relation. But this type of ordering of terms is not to be found in the domain of language.)

Attributes which we consider in a definition fall into three groups, viz. those which constitute the connotation of a term, those which follow from the connotation (known as properties) and those which neither constitute the connotation nor follow from the connotation (called accidents). If one states the entire connotation, i.e., proximate genus and differentia, we have the definition of the term. If, on the other hand, we enumerate its properties or accidents or merely a part of the connotation we have a *description*. A description is different from definition. While definition states the entire connotation, description states properties, accident and some times a part of the connotation. Definition is scientific while description is popular. The object of the former is to make our ideas of things distinct and clear while the object description is to furnish a rough and ready means of identifying an object.

There are different kinds of definitions

1) **Ostensive definition:** When we explain the meaning of a term by pointing or showing the corresponding object, it is called ostensive definition. For example, when a little child asks what a ball is, the best way to teach him the correct use of this term is to show him a physical object known as ball. Language is not needed to explain the meaning of a term. Thus ostensive definition is non-verbal in nature. All physical objects can be explained in this manner.

2) **Denotative definition:** When a term is defined by referring to the denotation of that term, it is called denotative definition. For example, to know the meaning of the term *Scripture* one can cite the names like the Vedas, the Bible, the Guru Grant Sahib, etc. Such definition is called verbal and denotative. Some times one can make use of the extension of the term to define it. This way of defining term is called extensive definition.

3) **Connotative definition:** When we explicate the connotation of a term, it is called connotational or connotative definition. It explicitly states the connotation of a term. Thus definition should be *per genus et differentia'*, which has been stated earlier.

3.3 RULES OF DEFINITION AND FALLACIES

A connotative definition should conform to the following rules;

Rule I: The definition should state the entire connotation of the term, neither less nor more.

The connotation of a term consists of common and essential attributes. Therefore, while defining a term we should avoid inessential attributes. Even common attributes may be avoided unless they are at the same time essential attributes as well.

Example: "Man is a rational animal" i.e., Man is that which has animality and rationality. Similarly 'a plane triangle is figure bounded by three straight lines'.

If this rule is violated, fallacies by stating either *more than* the connotation, or *less than* the connotation are committed. This suggests that the fallacy created by not following Rule I is of *two types*. Let us examine each separately.

A. If the definition states more than the connotation, the additional attribute would be either 1) superfluous or 2) an inseparable accident or 3) a separable accident, leading to the fallacies of *Redundant*, *Accidental* and *Too Narrow definitions*.

1. **Fallacy of Redundant definition:** If the additional attribute be a property we have the fallacy of redundant definition. The additional attribute is a common attribute but not an essential attribute. Hence it is superfluous to state it in a definition. For example, the definitions of triangle as "A plane figure, bounded by three straight lines, and having three angles" is a redundant definition because, the attribute of "having three angles" is superfluous.

2. **Fallacy of Accidental definition:** If the additional attribute be an inseparable accident, we have the fallacy of accidental definition. For example, the definition of man as "A laughing rational animal " is an accidental definition, because the attribute laughing even though as an attribute is found at times in men, is not a part of the connotation of the term man.

3. **Fallacy of Too narrow definitions:** If the additional attribute be a separable accident we have the fallacy of too narrow definition, because it is no longer

applicable to its whole term but only to a part of it. For example the definition "Man is a civilized rational animal" is too narrow as the attribute *civilized* does not belong to all men. Similarly, if we were to define a triangle "as a plane figure enclosed by three equal straight lines", it is not sufficiently extensive.

B. Now let us attend to the next section. If the definition states something *less than* the connotation we have the fallacy of too wide definition. It is so called because it will apply to a greater number of things than are included in the denotation of the term defined. For example, "diamond is carbon" is too wide because it not only applies to diamond but also to all things made up of carbon.

Rule II: The definition should be clearer than the term defined and should not, therefore, be expressed in figurative, ambiguous or obscure language.

Violation of this leads to the fallacies of *figurative* and *obscure* definitions.

Examples for **figurative definitions**: 1) "Childhood is the morning of life"

2) "Necessity is the mother of invention"

Example for **obscure definitions:** A girl is a perpendicular biological phenomenon in short skirt.

Rule III: The definition should not contain the term defined, or a synonym of it.

Violation of this rule leads to the fallacy of *circular definition*. For example "the sun is the center of the solar system". Here the term *solar system* already presupposes *Sun* that is to be defined.

Rule IV: **A definition should not be negative when it can be affirmative. A definition should positively state what the term means if it is possible to make an affirmation about it. A negative proposition merely states what a term does not mean.**

Violation of this rule leads to the fallacy of negative definition.

Examples: 1) "Mind is not matter."

2) "Failure is but want of success."

When we find it difficult or absolutely impossible to define a term, the so-called negative definition may come to one's aid to describe the entity. In Indian philosophical tradition while defining Brahman, the Advaita resorts to this type of definition presenting well the incapability to connote Brahman positively. Indian logicians however took objections to this type of definition.

To conclude, a definition should be a precise, clear and adequate, and should not be tautologous, redundant or negative.

3.4 LIMITS OF DEFINITION

Following are the limits of definition:

Summum genus cannot be defined. We have already seen that a definition should be *per genus et differentiam*. The *summum genus*, being the highest genus, cannot be brought under a still higher genus and there fore, it cannot be defined.

Singular abstract names, which are names of elementary attributes, cannot be defined because there is nothing simpler or more elementary than what they are. For example, terms like equality, energy, etc. cannot be defined.

Proper names and individual objects are indefinable. Proper names cannot be defined since they do not possess any connotation. Individual objects posses an infinity of attributes and therefore it is impossible to complete enumeration of all the attributes of them. Hence they too cannot be defined.

Check Your Progress I

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1) What is definition and what are its different kinds?

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2) Explicate the rules of connotative definition.

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3.5 ON DIVISION

Aristotle and the medieval logicians tried to integrate definition with division. For them to define means to divide and vice versa. According to these logicians definition also means the division of bigger classes into proximate classes. Only classes are divided, individuals cannot be divided. Also the smallest class cannot be divided at all. The smallest or lowest class is known as the *infima species*. It should be remembered in this connection that Aristotle and the medieval logicians conceived language as consisting of only classes and sub-classes. But as a matter of fact this is not so. There are various types of words and terms in language which do not fit into this scheme. Let us understand more about Division.

Division is the splitting up of genus or higher class into its constituent species or subclasses according to a certain principle. It is different from definition to the effect that the former is the analysis of the denotation of a term while the latter is the statement of its connotation. In fact logical division is division of a class into sub-classes and not a division of an individual thing into its different parts. To this extent it is different from natural division.

There are various types of division viz., 1) natural division, 2) metaphysical division and 3) logical division. Classification and division which characterize biology is an example of natural division because it is easily discerned in nature itself. Man has no role to play in it. Metaphysical division is, on the other hand, the same as conceptual analysis. Substance- attribute, cause-effect, space-time, particular- universal, etc., illustrate metaphysical division.

Both natural division and metaphysical division should be distinguished from logical division. Unlike the former two types it cannot be applied to an individual thing but

only to a class of things. Logical division is the analysis of the extension of class terms. Here one splits a genus into its constituent species. It is closely connected with the process of classification of connotative definition. It is said that in defining we divide and in dividing we define. In order to define the term *man*, we state its genus *animal* and its differentia *rational*. This necessarily implies that the class of animal can be divided into two sub-classes from the standpoint of having or not having rationality, i.e., man and not-man. This way of defining involves division. Again, when we divide triangle into *equilateral, isosceles and scalene* taking into consideration the equality of sides, the definitions of these terms are evident, since their genus is triangle and the differentia are *having three equal sides, having two equal sides and having unequal sides* respectively. Thus division involves definition. When the term animal is divided, the term man is defined and when the term man is defined, the term animal is divided. Thus the primary aim of division is to make the meaning of the term clear.

3.6 RULES OF LOGICAL DIVISION

Logical division should abide by the following rules that follow from the very nature of the division**.**

Rule I: The term to be divided must be a general term:

This rule is evident from the very definition of logical division. It is only a class, which can be divided into its sub-classes. Division aims at giving us a complete idea of the extension of the term and all the sub classes constitute the extension of the class.

Rule II: Logical division must be according to one definite principle:

If more than one principle is adopted we shall commit the fallacy of cross division. Division of students into tall, intelligent, fair and backbenchers is a case of cross division. Here the sub classes get mixed up together. In this case we have adopted four principles of division, namely intelligence, height, complexion and sitting habit. Consequently the very purpose of division is defeated.

Rule III: The name of the class divided must be applicable to each of the subdivisions coming under it:

All subclasses of a higher class belong to that class. Hence in every logical division the sub-divisions may take the name of the class. Thus when the term man is divided into the subclasses, tall, short and medium sized, all these subdivisions being subdivisions of the class *man*, we can tell them to be tall man, short man and medium sized man. But division of man into head, hands, legs etc. is not a case of logical division. In these cases it is not possible to apply the term to each of the above parts, the 'head' is not man, 'hands' are not man.

Rule IV: The sub-classes taken together exhaust the extension of the term defined:

Division aims at giving us a complete idea of the extension of the term. Denotational definition is bound to be incomplete and hence extensional definition is preferred. In giving extensional definition we point out all the subclasses and if any sub-class is left out the division is incomplete. Dividing triangle into acute angled and right angled is incomplete because obtuse angle triangles are left out.

Rule V: The sub-classes to which the term is divided must be mutually exclusive.

This follows from the rules that division must be always on single and fundamental principle. If the classes are not mutually exclusive we are sure that more than one principle have been adopted and the second rule has been violated. Thus the division of man into rich, tall and honest illustrates the fallacy of overlapping division. The subclasses are overlapping, not exclusive.

Rule VI: In a continued division each step should divide a class or sub-class into its proximate sub-classes.

This means division must not take a leap. If a logical division involves more than one step, it should be continuous, proceeding step by step without omitting any intermediate species. Violation of this rule leads to the fallacy of too narrow division. For example, rectilinear plane figures should not be divided immediately into such remote species as equilateral triangles, squares, parallelograms etc.

It may also be noted that the rules mentioned above are all inter- connected. Hence the violation of any one of them may, at the same time, involve violation of other rules as well.

3.7 DIVISION BY DICHOTOMY

In many cases, it is difficult to assure us whether all the rules have been duly satisfied or not. Further, without material knowledge of the things denoted by the term it is not possible to have a correct form of logical division. In order to avoid these difficulties, a form of division called *Division by dichotomy* is suggested. Dichotomy literally means dividing into two. Division by dichotomy is illustrated when we divide a class into two complementary subclasses. For example, if we divide people of the world into Asians and non-Asians, then we have division by dichotomy. For someone familiarized with the rules of division it is clear that to assume ourselves whether all the rules have been duly satisfied or not seems an uphill task. Further, without the material knowledge of things denoted by a term, it is not possible to have a correct form of logical division. Since there is more than one principle of division, subclasses must not overlap and when taken together the subclasses should be equal to the class divided. Now it is clear that we are incapable of being certain that a particular logical division conforms to all the rules if we lack knowledge of the things denoted by the class to be divided. This kind of material knowledge is wanting in formal logic. Hence formal logicians conceived this kind of division.

This division is done by mere form of the division. In this type even without my knowledge of the subject matter, which is being divided, we may be certain that the rules of division have been observed. Such a type of division is suggested to avoid difficulties that may arise as cited above (in fact some logicians consider division as a part of material logic).

There cannot be more than one principle of division operating simultaneously. Therefore two subclasses can be obtained according to the principles of excluded middle and non – contradiction and therefore they must be mutually exclusive and together must be equal to the denotation of the class divided. In this way, the rules of division are observed, yet knowledge of the subject matter is not necessary.

Division by dichotomy has its strength and weakness. Its strength is that it ensures the completeness of a division in a formally perfect fashion as it is based on the laws of contradiction and excluded middle. At the same time, it is open to the serious objection that this type of division is superficial whereas what is expected of logical analysis is much deeper and clear division.

Check Your Progress II

Note: a) Use the space provided for your answer.

b) Check your answers with those provided at the end of the unit.

1) What is division? Explain various kinds of division?

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2) Sate and explain rules of logical division.

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3.8 LET US SUM UP

In this unit we have taken up a very important problem in logic, namely the nature, types, functions and fallacies of definition along with logical division, which should necessarily form part of any course in logic. The problem of definition is clubbed with division since the course to be studied along with definition carries almost the same subject matter and their explanations are mutually dependent.

We have seen that definition is the explicit statement of all the essential attributes connoted by a term. The purpose of defining a term, it was clarified, is to understand the nature of a term. After examining the nature of definition we have looked into the various rules of definition, violation of which would end up with definitional fallacies. It was noted that certain entities or terms are beyond the scope of definition and therefore, remain indefinable. Definition and division are interconnected issues. Different types of division viz., physical, metaphysical and logical were also discussed. Of these it was logical division that demands the attention of logicians. In division there are six rules, violation of which leads to fallacies of division. Since in many cases it is difficult to assure ourselves whether all the rules have been duly satisfied or not, logicians propose a type of division applicable in formal logic, namely division by dichotomy. Division by dichotomy is that type of division, which divides a class into two contradictory sub-classes, for example, the class of people on earth into Asians and not-Asians.

3.9 KEY WORDS

Meaning : Meaning is associated with connotation. It is precisely what we ought to understand.

Language : Language is the systematic creation and usage of systems of symbols referring to linguistic concepts with semantic or logical or otherwise expressive meanings.

Predicables : Predicables are the possible relations of the predicate to the subject. In this regard logician Porphyry spoke of five predicables, viz., genus, species, differentia, property and accidents. Genus and species refer to the denotative function of the terms; the other three refer to the connotative functions.

3.10 FURTHER READINGS AND REFERENCES

Copi, Irving M. and Cohen, Carl. *Introduction to Logic*. New Delhi: Prentice-hall of India Private Limited, 1997

Felice, Anne. *Deduction*. Coclin , 1982

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3.11 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress I

1. The connotation of a term consists of common and essential attributes included in the term and definition means an entire connotation of the term. The purpose of definition is to understand the nature of the term. There are different kinds of definition: ostensive, denotative and connotative definitions. Ostensive: defining by pointing to the object; denotative: definition by referring; connotative: defining per genus et differentia.

2. Rule 1: A definition should state the entire connotation of the term, neither less nor more.

   Rule 2: A definition should be clearer than definiendum and should not, therefore, be expressed in figurative, ambiguous or obscure language.

   Rule 3: A definition should not contain definiendum or a synonym of it.

   Rule 4: A definition should not be negative when it can be affirmative.

Check Your Progress II

1. Division is the splitting up of genus or higher class into its constituent species or subclasses according to a certain principle. These are various kinds of division: natural, metaphysical and logical. Natural: division among living beings, Metaphysical: conceptual analysis undertaken by philosophers, Logical: the analysis of the extension of class term.

2. Rule 1: The term to be divided must be a general term.

   Rule 2: Division must be according to one definite principle.

   Rule 3: The name of the class divided must be applicable to each of the Sub-divisions coming under it.

   Rule 4: The subclasses taken together exhaust the extension of the term defined.

   Rule 5: The subclasses to which the term is divided must be mutually exclusive.

   Rule 6: In continued division each step should divide a class or subclasses into its proximate sub-classes.