

Logic : Nature & Scope, Truth and Validity

Kinds of proposition: Traditional and Modern

1. Who is the father of logic?

Ans:- Aristotle is the father of logic.

2. Is it true that 'logos' means thought as expressed in language?

Ans:- it is true that logos means thought as expressed in language.

3. Is logic a positive science?

Ans:- No logic is not a positive science, it is a normative science.

4. What is the ideal of logic?

Ans:- The ideal of logic is truth.

5. Is logic useful for valid thinking?

Ans:- Yes, logic is useful for valid thinking.

6. What are the things included in the subject matter of logic?

Ans:- Truth & validity.

7. How many terms are there in a logical proposition?

Ans:- Two

8. Is the Copula a term in a logical proposition?

Ans:- No

9. According to quantity, propositions are classified into two.

10. what is the symbolic name of a particular affirmative proposition?

Ans:- I proposition

11. A judgment when expressed in language is called proposition.

12. In a categorical proposition the relation between the subject & the predicate is without / under condition.

Ans:- without.

13. A judgment is/ is not a mental process.

Ans:- is mental process.

14. 'O' proposition is universal/particular negative.

Ans:- Particular negative.

15. The quality is categorical or conditional according to relation.

16. According to mixed principle of quality and quantity propositions divided into 4 kinds.

17. Conditional propositions are divided into hypothetical and disjunctive.

18. How many parts are there in a hypothetical propositions?

Ans:- Two parts.

19. "The sun rises in the east" - Is this a particular proposition?

Ans:- No.

20. Karim is a good boy - is a kind of universal affirmative proposition.

21. In simplification the meaning should not be changed of ordinary sentences.

22. Negative sentences with the words less, few, etc. should be transformed into 'T' proposition.

23. On what ground modern logicians classify propositions?

Ans:- Elements of proposition.

24. Basically how many kinds of propositions do we have in modern logic?

Ans:- 3 propositions.

25. In what sense the term 'or' is used in disjunctive proposition?

Ans:- Inclusive sense.

26. 'Thief' ! 'Thief!' What kind of proposition is it?"

Ans:- Subjectless Simple proposition.

27. How many kinds of simple proposition do we get in logic?

Ans:- Four.

28. The word 'or' in alternative proposition used in inclusive / exclusive sense.

Ans:- Exclusive sense.

29. Compound proposition is called an atomic/ molecular proposition.

Ans:- Molecular proposition.

30. A proposition which asserts existence of something is general proposition.

31. In modern proposition there are any 2/3/ any number of terms.

Ans:- Any number of terms.

32. Connective / structure determine form of proposition.

Ans:- Connective.

33. In a hypothetical proposition the implicant is antecedent / consequent/ both.

Ans:- Antecedent

34. Traditional logicians recognise four kinds of proposition.

35. A & I are Sub- altern proposition.

36. E proposition distributes both Subject & predicate.

37. Particular propositions do/don't distribute their subjects.

Ans:- Don't distribute their subject.

38. What is logic?

Ans:- The word "logic" is derived from Greek word "logike". "Logike" is the adjective form of Greek word 'logos' which means "thought". So, etymologically logic is the science of thought expressed in language.

39. Define positive science.

Ans:- Science has been divided into two types - positive & normative. A positive science is one which deals with the things as they really are. A positive science gives explanation of the things as it is. Physics is a positive science so it studies physical phenomena which actually happen in nature.

40. Define normative science.

Ans:- A normative science is one which deals with things they should be. It is called normative because it sets before itself a norm or an ideal & things are judged from the stand point of that ideal. Ethics is a normative science because it refers to the ideal of 'good' and "rightness" & "wrongness" is judged from the ideal of good. The distinction between positive science & normative science is that of a distinction between things as they are and things as they should be, between real and ideal, between 'is' and 'ought'.

41. Is logic normative science?

Ans: Logic is a science because it determines to know in a Systematic way the general principles of correct thinking. Logic is a normative science because it is concerned with the question what ought to think. It sets before itself the ideal of truth. Logic refers to the ideal of truth or judges the correctness of our thinking with reference to the ideal of truth.

42. What is a proposition?

Ans:- A proposition is a statement of a certain relation between two terms. There are terms in a proposition & a certain relation between these two terms are stated in a proposition. A proposition must consist of 3 parts, viz., two terms & the sign of relation between them. Of these two terms, one is the subject and other is the predicate. The sign of relation is known as Copula. For example, "Man is mortal", here 'man' & 'mortal' are two terms, 'is' is the copula which stands as the sign of relation between two terms.

43. Explain the modern classification of proposition.

Ans:- In modern logic propositions broadly classified into two types are -elementary proposition and non-elementary proposition. Elementary propositions again are of two types - simple proposition and compound proposition. Non-elementary proposition assume only one form and that is general proposition. Thus in modern logic propositions mainly are of 3 kinds - Simple proposition, compound proposition & general proposition.

44. Define singular and general proposition

Ans:- A singular proposition is one in which the subject is a singular term. E.g. Ram is mortal. A general proposition is one where subject is a general term where we take it in its entire denotation, e.g. All men are mortal.

45. Define exclusive & exceptive proposition.

Ans: - An exclusive proposition is that in which the predicate is limited in its application to the subject of the words like only, alone, none -but etc. E.g. God alone is perfect. An exceptive proposition is that in

which the subject is limited in its application by the word like, except, save, but etc. All students but one present.

46. Explain the modern analysis of proposition.

Ans: - Modern logicians like Bradley, Johnson. & others have analysed a proposition into its constituents & components. According to them, the elements in which proposition can be analysed are called constituents. The elements which combine other elements of proposition is called component. E.g., Ravi hates John. Here, 'Ravi', 'John', 'hate' are three constituents of the proposition because there are the three elements into which this proposition can be analysed. The constituent 'hate' combines the constituents 'Ravi' & 'John'. So, 'hates' is a component.

47. How does a component differ from constituents of proposition?

Ans: - I) Any element of a proposition is called constituents, whereas only that element which combines other elements of a proposition is called component.

II) A component is universal while the constituent can be particular.

III) The constituent indicate the content of a proposition. The form of a proposition. depends upon the way the constituents are combined.

48. What is the nature of logic ?

Ans:- If we analyse the nature of logic, we find: a. Logic is concerned with mediate knowledge and not with immediate knowledge. logic is primarily concerned with the problem of proof. Mediate knowledge requires proof for establishing validity. So, logic is concerned with mediate knowledge only.

b. Logic is concerned with both formal & material truth. Formal truth & material truth are complementary to each other. The distinction between formal truth & material truth is made only for convenience of treatments. Logic is both formal & material as whatever is maternal must be formal also.

c. Logic is both a science and an art. Science and art are complementary to each other. In logic we can have knowledge of the general principles of correct thinking & at the same time we can attain truth & avoid error by the obligations of the rule in practice. logic is both a science as well as an art.

d. Logic is a normative science & not a positive science. Logic sets before itself "truth" as an ideal or norm & tries to know the conditions which correct reasoning fulfill.

49. What is your idea about the scope of logic?

Ans:- a. Logic is called a science of thought. Logic is concerned with those thoughts which are related to reasoning. Reasoning is the special kind of thinking which can be termed as inference.

b. The main subject matter of logic is reasoning. Reasoning is not the whole of thought but it is a part of thought. The subject matter of logic includes deductive as well as inductive reasoning. Logic is concerned with valid reasoning or correct thinking with some of its auxiliary processes like definition, discussion etc.

c. Logic is concerned with validity & invalidity of arguments. Reasoning is also known as argument. An argument is a group of propositions where pass from the given premises to a new conclusion & arguments become valid by following certain rules and invalid by violating those rules. The chief concern of logic is the determination of validity of arguments. Reasoning is the process of passing from one or more judgments to another which is justified by them & the product is also called a reasoning.

d. Logic discusses some deductive & inductive fallacy which is derived due to violation of certain rules formulated by it.

e. Logic is concerned with certain laws of thought. Logic assumes certain fundamental principles of thought such as law of identity, law of contradiction & law of excluded middle. Logic takes for granted these principles without proof to which all other thoughts must confirm in order that they may be valid.

50. Write a short note on utility of logic.

Ans:- a. Logic helps us to think or reason something validly or correctly.

- b. Since logical thinking is valid thinking, logic becomes a backbone of every field of enquiry. It helps us to study any subject in a planned, precise & systematic manner.
- c. Logic helps us to distinguish between valid arguments from the invalid one. By the application of the rules of logic the fallacy of invalid arguments can easily be detected.
- d. Logic is employed in every act of our life though we are not conscious of it. Logic is indispensable in our day to day life.

51. Define formal truth & material truth.

Ans: Logic is concerned with formal truth and material truth. Truth means consistency among ideas or thoughts themselves. Truth correspondence of thought or Ideas with facts or things of the world. So there implies two kinds of truth viz., formal truth and material truth. Formal truth means self consistency or freedom from self-contradiction amongst thoughts themselves, e.g, a round circle. Material truth means correspondence of thought with things of the actual world e.g, green leaves of tree. But both don't always go together. Whatever is materially true is also formally true, but whatever is formally may not be materially true.

52. Is logic science & art or both?

Ans:- Scientific knowledge is methodical, general, rational, verifiable, accurate & certain as science is systematic body of knowledge relating to a particular department of nature. An art is a body of practical rules or techniques for the attainment of certain end. It teaches us how to apply knowledge into actual practice to realise some definite purpose. Logic determines in a systematic manner the general principles of correct thinking. Logic gives us the knowledge of the general principles of correct thinking. So logic is a science. The logic also teaches us how to apply the principles formulated by it in actual practice for the realisation of truth. So logic is an art also. Logic is a systematic study of general principle of correct thinking view to apply that into actual practice for the attainment of truth. Hence logic is both science or an art. Logic teaches us how to attain truth by applying body of scientific knowledge to practice.

53. Explain truth and validity with example.

Ans:- An argument consists of proposition. Truth & falsity may be predicted of propositions, but be never of arguments. And the attributes of validity & invalidity can belong only to deductive arguments never to propositions. There is a connection between validity and invalidity of an argument and the truth and falsity of premises and conclusion. Argument may exhibit different combination of true & false premises & conclusions. Some valid arguments contain only true propositions e.g.

All whales are mammals
All mammals have lungs.
∴ All whales have lungs.

An argument may also consists entirely of false propositions to nevertheless be valid, e.g.,

All spiders have 10 legs.
All 10 legged creatures have wings.
∴ All spiders have wings.

An argument may have premises that are all true & have a true conclusion and nevertheless be Invalid, e.g.,

If I own all the gold in the fort knox then I would be wealthy.
I don't own all the gold in the fort knox.
∴ I am not wealthy.

Arguments with false premises & true Argument conclusion may be valid or invalid. Here is an example of valid argument with false premises and true conclusion, e.g.,

All fishes are mammals.
All whales are fishes.
∴ All whales are mammals.

Here is an example of an invalid argument with false premises & a true conclusion, e.g.,

All mammals have wings.
All whales have wings.
∴ All whales are mammals.

Finally there are invalid arguments whose premises and conclusion are false, e.g.,

All mammals have wings.
All whales have wings.
∴ All mammals are whales.

A form of argument is said to be valid when it cannot be that we take the premises to be true and conclusion to be false. Thus, with a validity though are distinct, they are inter-related. When The argument is valid & the premises are materially true, the conclusion is bound to be materially true. When an argument is valid, all its premises we call it sound.

54. How does a proposition differ from a sentence?

Ans:- In English grammar, a sentence is a combination of words conveying a definite meaning. There are points of difference between a grammatical sentence and a logical proposition which are as follows—

I) Every grammatical sentence has two parts - a subject & a predicate. But A logical proposition consist of 3 parts, viz. subject, copula & a predicate.

II) In a grammatical sentence we need not mention clearly the quality and quantity. But in every logical proposition we must mention the quality & quantity.

III) A grammatical sentence may be used in any tense - past, present & future. But a logical proposition must always be used in the present tense.

IV) In grammar various kinds of sentences are used, But in logic only assertory sentences are used as logical proposition

V) Grammatical sentences may be true or false & also neither true nor false. But logical propositions are either true or false.

55. Classify proposition according to traditional logic.

Ans:- According to the principle of composition, propositions. Classified into two- a) simple proposition which expresses a single statement, e.g., All men are mortal. B) A compound proposition which is one that consists of two or more propositions combined together, e.g., Ram is a boy & Sitä is a girl.

According to the principle of relation, propositions are classified into two- (a) Categorical proposition is one in which the predicate is affirmed or denied without any one restriction or condition, e.g No men are perfect. (b) Conditional proposition is one in which the predicate is either affirmed or denied of the subject under certain condition of the form 'if.... then', or 'either...or', If it rains then the ground is wet.

According to the principle of quality, propositions are divided into two types - (a) Affirmative proposition is one which the predicate is affirmed of subject, e.g, Some men are wise. (b) Negative proposition is one in which the predicate is denied of the subject, e.g, Some men are not wise.

According to the principle of quantity propositions are classified into two - a) universal proposition is one where the predicate is either affirmed or denied of the whole subject, e.g All men are mortal (b) Particular proposition is one in which predicate is either affirmed or denied of part of the subject, e.g. Some men are wise.

According to import of significance, proposition is classified into two (a) Verbal analytic proposition is that in which the predicate merely states the connotation or part of the connotation of the subject, eg All men are rational.(b) Real or synthetic proposition is that in which the predicate doesnot state the connotation or part of the connotation of the subject but gives us a new information about the subject, e.q., All men are biped.

According to modality, propositions are classified into three – a) Necessary proposition is that in which the relation between the subject and the predicate is based on their very nature and constitution & expressed with the highest degree of certainty, e.g. Two and two must be four. b) Assertory proposition is that in which the relation between the subject & predicate is based on our experience & hence stated to be true in so far as our experience goes, e.g., Some men are wise. c) Problematic proposition is one in which the relation between the subject & the predicate is based on insufficient knowledge of the real state of things & is thus stated to be merely probable, e.g., He may be a poet.

56. What is fourfold classification of proposition?

Ans:- If the two principles, that is quantity & quality are mixed together, then according to the mixed principle of quantity and quality proposition is of 4 kinds. This kind of classification is called four fold classification of proposition. This is also called traditional scheme of classification of proposition.

The four fold propositions are-

- 1) Universal Affirmative proposition:- In this kind of proposition the predicate is affirmed of the whole of the subject. This is symbolised as A, e.g. All mothers are kind hearted.
- 2) Universal negating proposition:- In this kind of proposition, the predicate is denied of the whole of the subject. This is symbolically represented as E, e.g. No men are perfect.
- 3) Particular affirmative proposition:- In this kind of proposition the predicate is affirmed of the part of the subject. This is symbolised as 'I', e.g., Some men are wise.
- 4) Particular negative proposition:- In this kind of proposition the predicate is denied of the part of the subject. It is symbolically represented as O, e.g., Some men are not wise.

57. What is simple proposition? Explain its different kinds.

Ans:- Simple proposition is a proposition that consists of only one statement. In a simple proposition we don't find more than one component statement as such proposition conveys only one information or fact, e.g., It is raining today. Simple propositions are classified into 4 types.

A) Subjectless proposition:- It is the most primitive & simplest kind of proposition. In this kind of proposition there is no subject though the proposition makes a definite & meaningful statement. Subjectless propositions are of two types-

- i) Exclamatory proposition, e.g, Snake! Snake!
- ii) Impersonal proposition, e.g It rains.

B) Subject -predicate form:- In the subject predicate form of proposition, a statement is made about an individual as possessing some attribute, e.g., The ball is red.

C) Relational proposition:- When in a proposition a relation is indicated between two or more terms, it is called a relational proposition, e.g, The teacher teaches the student.

D) Class-membership proposition: The proposition which expresses that an individual or an object is a member of a class is called class membership proposition, e.g., Rabindranath was a poet.

58. What is compound proposition? Explain its different kinds.

Ans:- A compound proposition is that which contains two or more statements. There are various ways in which propositions are combined & on the basis of the ways of combining propositions, compound proposition is classified into 4 kinds:-

(a) Conjunctive proposition : A conjunctive proposition is a kind of compound proposition formed of two or more simple propositions with the conjunction 'and', e.g., Ram is a boy and Sita is a girl .

(b) Implicative proposition :- An implicative proposition is a kind of compound proposition which is formed by combining two or more simple propositions in which one of the constituent propositions implies the other implicative proposition, e.g, If you read then you will pass. Here, the constituent propositions – 1. you read 2. You will pass. The first proposition implies the second one.

(c) Alternative proposition:- An alternative proposition in which there are less or more alternatives. In an alternative proposition, one of the alternatives is asserted to be true. This proposition contains the expression not both, e.g., He is not both intelligent and good looking.

(d) Disjunctive proposition:- A disjunctive proposition is a kind of compound proposition which asserts that both the constituent proposition cannot be false but can both be true. In this proposition disjuncts are joined by 'either....or'. e.g., Either he is good looking or intelligent. Here, the disjuncts are – 1. He is good looking 2. He is intelligent.

59. What is general proposition? Explain its different kinds.

Ans:- General proposition is that which asserts that one class is wholly or partially included in or excluded from another class. In other words, a general proposition is that which asserts relation between two classes, e.g. 1. All men are mortal. 2. No new me monkeys. General propositions are of three kinds:-

A. Existential proposition:-An existential proposition is that what which directly affirms or denies the existence of something, e.g, 1. Mountains exist. 2. There is no golden mountain.

B. One - predicate universal proposition:- An one predicate universal proposition is that which either affirms or denies a property about the whole class, e.g 1. All things change. 2. Nothing to permanent.

C. General proposition asserting relation between two classes :- A general proposition asserting relation between two classes in that which states that one class is wholly or partially included in or excluded from another class, e.g, 1. All poets are men. 2. Some Indians are not poets.

60. Analyze the drawbacks of the traditional analysis of proposition.

Ans:- 1. According to traditional logicians every topical proposition must have two terms. But we view cannot be accepted. It is seen that very few propositions are two termed. Propositions may be subjectless also. Again a proposition have any number of constituents. but this s view is not taken in traditional analysis.

2. According to traditional logicians if any proposition is not in the strict logical form, i.e. subject-copula – predicate form then it must be reduced to that form by following the rule prescribed by them. But then also the difference between the relation and the attributes can't be bypassed. Such reduction is logically infertile & practically absurd.

3. Traditional logicians believed that there is only relation of predication between terms. They didnot realise that there are other relations also such as (1) membership of a class (2) inclusion of one class into another class.

61. what are the drawbacks of classification of proposition?

Ans:- 1. Every proposition according to traditional logic is of the order of subject- copula –predicate. But this order is not applicable to the modern logicians. A proposition may be if one word.

2. The traditional classification of proposition into AEIO pre- supposed that every categorical proposition is one of the four form. Thus all propositions are believed to be 'S-P'. But modern logicians objected reducing every proposition to 's_p" form and confining it to this restricted scope. According to them there are other forms of proposition also Modern logicians also criticised the traditional classification of proposition into categorical, hypothetical & disjunctive. Specially traditional treatment of disjunctive proposition is not at all satisfactory.

3. Hypothetical proposition of the traditional logicians is really implicative in nature. There is a necessary relation or implication between the antecedent and the consequent of this kind of proposition, so they are really implicative propositions.

Unit 2

Immediate inference: Conversion, obversion, Contraposition Square of Opposition: Traditional, Aristotelian and Boolean

1. Is it true that, an immediate inference, there are 2 premises?

Ans:- No

2. Obversion is an immediate inference- is it true?

Ans: Yes.

3. How many premises are required to draw a conclusion of an immediate inference?

Ans- One.

4. Give examples of immediate inference.

Ans- "Conversion, obversion & contraposition.

5. Can 'O' proposition be converted?

Ans:- No.

6. Is it true that there is one premise in an immediate inference?

Ans:- Yes.

7. Can A proposition be Simply converted?

Ans:- No.

8. Distinguish between immediate inference and mediate inference.

Ans:- In immediate, the conclusion is drawn from only one premise but in case of mediate inference the conclusion is drawn from more than one Premise. In immediate inference there are two propositions one premise and one conclusion. But immediate inference there is one conclusion and more than one premise.

9. What are the points of similarity between immediate and mediate inference?

Ans:- Both mediate and immediate inference are of deductive nature their conclusion cannot be more general than their premise or premises. In both the case of inference we are concerned with formal truth or validity only.

10. What are the different kinds of conversion?

Ans: conversion is of two kinds, namely, simple conversion and conversion per accidens. Simple conversion is that in which the quantity of the conclusion is the same as the quality of the premise, for example

E - No cat is rat

∴E – No rat is cat.

Conversion per accidens is that in which the quantity of the conclusion is different from quantity of premise.

A - All mothers are kind-hearted.

∴I - Some kind-hearted beings are mothers.

11. What do you mean by inference by converse relation?

Ans: Inference by converse relation consists in transposing the terms of a proposition and replacing the word indicating the relation between them by its core relations, for example,

A- Plato is the teacher of Aristotle.

∴A- Aristotle is the student of Plato.

This kind of conversion is possible when the subject and the predicate of a given proposition are a pair of relative terms.

12. What do you mean by conversion by negation?

Ans: According to conversion by negation O proposition can be converted. first of all, an O proposition is to be transformed into an I proposition by negating the sign of negation from the copula adding it to the predicate. And then that I proposition is to be converted according to the general rules of conversion, for example,

O- some men are not wise.

I- Some men are not- wise.

∴I- some not- wise beings are men.

13. why is conversion by negation not taken as a proper form of conversion?

Ans: According to one of the rules of conversion the quality of the conclusion must be same as that of the premise but here the quality of the premise is changed in the conclusion. The premise is negative but the conclusion is affirmative. According to another rule the predicate of the premise becomes the subject of the conclusion. But here the subject of the conclusion is contradictory of the given predicate.

14. What do you mean by material obversion?

Ans: According to Bain, there is a form of inference through a version which is known as material obversion. In material obversion there is obverse inference justified only on examination of the matter of the proposition.

A-knowledge is virtue.

∴A- Ignorance is bad.

15. Distinguish between argument and inference.

Ans: Inference is a mental process but when expressed in language it is called an argument. Every argument is expressed in a premise – conclusion structure.

16. State and explain conversion as a form of immediate inference.

Answer: Conversion is a form of immediate inference in which the subject and the predicate terms are legitimately transposed in the conclusion. In other words, the subject of the premise becomes the predicate and the predicate of the premise becomes the subject in the conclusion in conversion, the premise is called the convertend and the conclusion is called the converse. We can state the rules of conversion as follows:-

1. The subject of the convertend becomes the predicate of the converse and the predicate of the convertend becomes the subject of the converse.

2. The quality of the converting is retained in the converse.

3.No term can be distributed in the converse unless it is distributed in the convertend.

The first rule is involved in the very definition of the conversion the second rule is concerned with the quality of the convertend and converts since the term remains same their interchanging of places does not necessitate qualitative change. The third rule is a general principle of all deductive inference. In any conclusive inference we cannot go beyond the evidence, we cannot assert anything not implied in the original proposition. So, a term which is not distributed in the convertend cannot be distributed in the converse. Now, if we apply these rules to four standard form categorical proposition, we will find that only E and I proposition can yield valid conclusion. The converts of E and I propositions are their

respective equivalent. But the converse of an A proposition does not in general follow validly from a proposition. The converse of A is I. It cannot be A because in that case the predicate term which is not distributed in the conclusion is distributed in the premise. The converse of A is not the equivalent but its sub implicant. This form of conversion is called conversion by limitation in this process we interchange the subject and predicate and change the quantity of the proposition from universal to particular. Thus, from the premise 'All dogs are animals', the conclusion 'Some animals are dogs' can validly be inferred. Finally, it should be observed that converting an O proposition is not in general valid. From the true O proposition 'Some animals are not dogs' has its converse false proposition 'Some dogs are not animals', we see then that an O proposition and its converse are not in general equivalent. The following table gives a complete picture of a valid conversion-

Convertend

A- All S is P.

E-NO S is P.

I- Some as is P

O-Some S is not P

Converse

I- some P is S

(By limitation)

E-NO P is S

I- some P is S

– not valid.

17. State and explain Obversion.

Ans – Obversion is a form of immediate inference in which from a given proposition a conclusion is drawn by taking the complement of original predicate as predicate. And also by changing its quality. In this form of inference, the premise is called the obvertend and conclusion is called obverse. We can formulate the rules of the process of inference in the following manner:-

1. The original subject remains as the subject while the contradictory of the predicate becomes the predicate in the conclusion.
2. The quality of the obverse is the opposite of the quality of the obvertend .
3. The quantity of the obvertend and the obverse is the same.

We can proceed to give the obverse of the four categorical proposition. The A proposition 'All politicians are liars' has its obverse the E proposition 'No politicians are non- liars'. These two propositions are logically equivalent so either one can validly be inferred from the other. Obversion is a valid immediate inference when applied to any standard form of categorical proposition. Thus, the E proposition, 'No politicians are honest' has its obverse the logically equivalent A proposition 'All politicians are non- honest'. Similarly, the obverse of I proposition 'Some students are intelligent' is the O proposition 'Some students are not non- intelligent'. And finally the O proposition 'Some students are not industrious' has its obverse the I proposition 'Some students are non- industrious'. Every standard form categorical proposition is logically equivalent to its obverse. So, obversion is a valid form of immediate inference for any standard form categorical proposition. To obtain the obverse of a proposition we leave the quality and the subject unchanged, change the quality of the proposition and replace the predicate term by its complement. The following table gives a complete picture of all valid Obversion-

Obvertend

A- All S is P.

E-No S is P.

I- Some S is P.

O- some S is not P.

Obverse

E-No S is non- P

A- All S is non- P

O- Some S is not non- P

I- some S is non- P.

18. State and explain Contraposition.

Answer:- Contraposition is a kind of immediate inference which introduce no new principles. It can be reduced in a sense to conversion and obversion. To form the contrapositive of a given proposition, we replace the subject term by the contradictory of the predicate term and replace its predicate term by the contradictory of the subject term. Contraposition is most useful in working with a proposition and O

proposition we can get from any A proposition to its Contraposition by first obverting it, next applying conversion and then applying obversion again. Thus, beginning with All S is P, we obvert it to obtain 'No S is non- P', which converts validly to 'No non- P is S' whose obverse is 'All non- P is non- S'. Thus the contrapositive of any A proposition is the obverse of the obverted converse. The contrapositive of the O proposition 'Some students are not idealist' is 'Some non- idealists are non- students' which is logically equivalent to the first. Their logical equivalence can be shown by deriving the Contrapositive in the following schematic form- 'Some S is not P' obversed to 'Some S is non- P' which is converted to 'Some non- P is S' whose obverse is 'Some non- P is not non- S'. Contrapositive of E proposition 'No S is P' is 'No non- P is not non- S' which does not follow validly from the original. If we attempt to derive the Contrapositive of an E proposition by successive obversion conversion and obversion, we find the reason for the invalidity the obverse of E proposition 'No S is P' is the A proposition 'All S is non- P'. And it cannot validly be converted except by limitation. If we do convert it by limitation to obtain 'Some non- P is S' then the latter can be obverted to obtain 'Some non- P is not non- S' which we may call the contrapositive by limitation. Contrapositive of I proposition is not in general valid. The reason that contraposition is not generally valid when applied to I proposition can be seen when we attempt to derive the contrapositive of an I proposition. The obverse of I proposition 'Some S is P' is the O proposition 'Some S is not non- P' whose conversion does not in general follow validly from it. Thus, we see that contraposition is a valid form of immediate inference only when applied to A and O propositions. Contraposition is not valid at all for I proposition and for E proposition only by limitation. This may also be presented in the form of a table.

Premise.

A- All S is P

E-No S is P.

I- Some S is P

O-Some S is not P

Contrapositive

A- All non- P is non- S

O- Some non- P is not non- S
(By limitation)

- not valid

O- Some non- P is not non- S.

19. What is the process of converting definition, tautologous proposition and the like?

Answer: When in an A proposition, the subject and the predicate have the same denotation, it can be converted simply.

1. Definition-

A all men are rational animals

∴ A- All rational animals are man

2. Tautologous proposition-

A- All men are human beings

∴ A-All human beings

3. Proposition in which all the subject and the predicate are definite singular terms-

A- Everest is the highest mountain

∴A- The highest mountain is everest.

4. Proposition in which the predicate is the peculiar quality possessed only by the subject-

A- All manner laughing animals

∴ A- All laughing animals are men.

20. Is material obversion a real type of obversion?

Answer: Material obversion cannot be regarded as a real type of obversion on the following grounds –

1. According to the rule of the Obversion the subject of the Obvertend becomes the subject of the obverse. But in material Obversion, the contrary of the subject of the obvertend becomes the subject of the obverse.

2. Rule of obversion requires that the predicate of the obverse should be the contradictory of the predicate of the obvertend. But in case of material obversion the predicate of the conclusion is the contrary of the predicate of the given proposition.

3. The quality of the obvertend should be changed in the obverse but in case of material obversion quality of the premise and the conclusion is the same.
4. In deductive inference the conclusion is implicitly contained in the premise and necessarily follows from the premises. But this is not the applicable in case of material obversion.
5. Inference through material obvers requires some practical knowledge or experience of the nature of the subject and the predicate the abortion as a deductive inference is concerned with formal truth and not with material truth.

21. What are the characteristics of deductive inference?

Answer: 1. The conclusion follows from one or more premises.

2. The conclusion necessarily follows from premises as the conclusion is implicitly contained in the premise.
3. The conclusion cannot be more general than the premises as the conclusion necessarily follows from the premises.
4. As the conclusion is implicitly contained in the premises and necessarily follows from the premises, so if the premises are true the conclusion must be true.
5. It is not concerned with the material truth of the conclusion if the conclusion necessarily follows from the premises by following all the rules of the premises, the inference will be formally true or valid.

22. What are the characteristics of inductive inference?

Answer – 1. The conclusion follows from more than one premise.

2. As the conclusion is not implicitly contained in the premises, so the conclusion does not necessarily follow from the premises.
3. The conclusion is more general than the premises.
4. As the conclusion goes beyond the premises, so the truth of the premises cannot prove the truth of the conclusion.
5. Although the conclusion of the inductive argument cannot prove the truth, yet it can help in the discovery of truth.

23. Distinguish between deductive and inductive inference.

- Answer: 1. Deductive inference is mainly an inference from the general to the particular. On the other hand, inductive inference is inference from the particular to general.
2. In deductive inference the conclusion necessarily follows from the premises but in inductive inference the conclusion does not necessarily follows.
 3. The conclusion of a deductive inference cannot be more general than the premises. But the conclusion of an inductive inference is always more general than the premises.
 4. Deductive inference is concerned with the formal truth or validity. Inductive inference on the other and is concerned with material truth of the constituent proposition.
 5. In a deductive inference the conclusion cannot go beyond the premises but in inductive inference the conclusion goes beyond the premises.

24. Explain Aristotle's square of opposition.

Ans:- Aristotle has used 'opposition' in the popular or ordinary sense. He says that if both of the two propositions are true at the same time, we cannot say that there exists an opposition between them. He rejects the sub- alternation and sub-contrary opposition on this basis . He recognises only two kinds of opposition viz., contrary opposition and contradictory opposition.

Contrary opposition:- Contrary opposition is relation between two propositions which have subject same predicate but which differ in quantity only, e.g.,

A- All men are mortal.

E- No men are mortal .

Here, if one of the proposition is true, the other is false but not conversely.

Contradictory opposition:- Contradictory opposition is the relation between two propositions having the same subject & same predicate but differing in both quality and quantity, e.g.

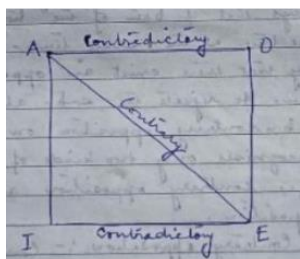
A- All men are mortal.

O- Some men are not mortal.

E- No men are perfect.

I- Some men are perfect.

Here, the truth of one implies the falsity of the other and conversely. The diagram representing the The Aristotelian Square of Opposition as follows-



25. Distinguish between Aristotle's Square of opposition and traditional square of opposition.

Ans: Opposition of proposition may be defined as the relation between two categorical propositions having the subject and predicate but differing in quantity only or in quality only or both in quality and quantity. The square of opposition which is a diagram represents the four kinds opposition of proposition for kinds The four kinds –

Sub- alternation:- Sub-alternation is the relation between two propositions which have the Same subject, some predicate & also the same quality but which differ in quantity only. It is not regarded as opposition by some thinkers because the two sub - alterns may both be true or false at the same time which is not the actual meaning of opposition, e.g.,

A- All men are mortal.

I- Some men are mortal.

E- No men are perfect.

O- some men are not perfect.

Contrary opposition: Contrary opposition is relation between two universal proposition which have same subject and same predicate but which differ in quality only, e.g.,

A- All men are mortal.

E- No men are mortal.

Here, if one of the proposition is true the other is false but not conversely.

Sub-contrary opposition : Sub- contrary opposition is a relation between two particular proposition which have the same subject and same predicate but which differ only in quality. The falsity of one implies are truth of the other but not conversely, e.g.

I- Some men are honest.

O- Some men are not honest.

Contradictory opposition – Contradictory opposition is the relation between two propositions having the same subject & same predicate but differing in both quality & quantity, e.g.

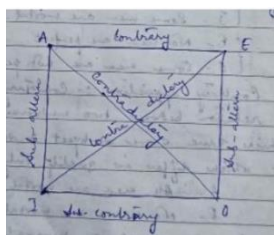
A – All men are mortal .

O - Some men are not mortal.

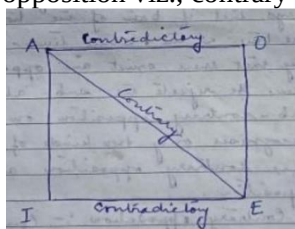
E- No men are perfect.

I- Some men are perfect.

Here, the truth of the one implies the falsity of the other and conversely.



Aristotle has used 'opposition' in the popular or ordinary sense. He says that if both of the two propositions are true at the same time, we cannot say that there exists an opposition between them. He rejects the sub-alternation and sub-contrary opposition on this basis. He recognises only two kinds of opposition viz., contrary opposition and contradictory opposition.

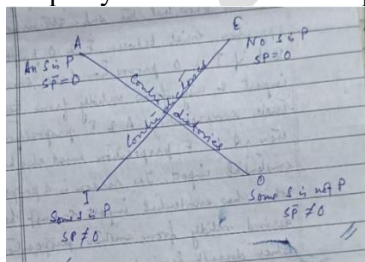


26. Explain Boolean symbolisation of categorical proposition or Boolean square of opposition.

Ans: - The Boolean interpretation of categorical proposition depends on the notion of empty class. It is the notion of an convenient to have a special symbol to represent it. For this purpose we use the symbol (zero) '0' to say that the class denoted by the term 'S' has no members, we write an equal sign between S and (zero) '0'. To assert that there are 'S's is to deny the proposition symbolised by " $S=0$ ". We symbolise that denial by drawing a slanting line through the equality sign. Thus, the inequality $S \neq 0$, saysthat there are S's. Standard form Categorical proposition refer to two classes, where each of two classes is already designated by a Symbol. The class of all things that belonged to them can be represented by just opposing the symbols for the two original classes.

Now, we can symbolise 'E' & 'I' propositions as equations and inequalities. The 'E' proposition, 'No S is p' says that no members of class S are members of class P. It means that product of the two classes is empty which is symbolised by the equation ' $SO = 0$ '. The 'I' proposition 'Some S is P' says that at least one member of S is also member of P. This means that the product of the classes S & P is not empty and is symbolised by the inequality " $SP \neq 0$ " (zero). To symbolise A & O propositions, it is inconvenient to introduce a new method of representing class compliments. The compliments of the class "All men" is the class of all things that all are not men, where the letter 'S' symbolises the class of "all men". We symbolise the class of all non-men by S bar.

The 'A' proposition, 'All S is P' says that all members of the class S are also members of the class P. It is symbolised by the equation, $SP(\text{bar}) = 0$. "The O' proposition 'Some S is not P', which is logically equivalent to I proposition 'Some S is non-p' is symbolised by the inequality $SP(\text{bar}) \neq 0$. It is obvious that A and O propositions are contradictory, when they are symbolised as $SP = 0$ and $SP(\text{bar}) \neq 0$. And it is equally obvious that E' & 'I' propositions are Symbolised $SP = 0$, $SP(\text{bar}) \neq 0$ are contradictory.



Unit 3

Mediate Inference: Categorical Syllogism, Copi's Six Rules of Syllogism Figure and Mood, Venn Diagram Technique for Testing Syllogism

1. Is it true that in a categorical syllogism there is only one middle term?

Ans:- yes

2. which term determine the figure of syllogism?

Ans: Middle term

3. How many valid moods are there in Third figure?

Ans- 6 valid Moods.

4. In the first figure the major premise must be particular proposition — is it true?

Ans- No.

5. What is the name of the predicate of the conclusion of a syllogism?

Ans:- Major term

6. In the second figure the middle term is used subject / predicate a both the premises.

Ans- Predicate

7. In the fourth figure of syllogism there are ____ Valid moods.

Ans:-5

8. which proposition is used as major premise in the valid moods of the third figure?

Ans- Any proposition can be used as major premise in the valid mood of 3rd figure.

9. In the fourth figure the middle term is used as predicate in the major premise and Subject in the minor premise.

10. How many forms of syllogism are there?

Ans:- 2 forms (Pure & Mixed).

11. How many forms of pure syllogism are there ?

Ans:- 3 forms, viz, Pure Categorical, pure disjunctive, pure hypothetical.

12. How many forms of mixed syllogism are there?

Ans:- 3 forms, viz., disjunctive categorical, hypothetical categorical and dilemma.

13. BAROCO is a valid mood of ____ figure .

Ans: 2nd

14. In Categorical syllogism from two particular premises conclusion can/can't be drawn.

Ans- Can't be drawn.

15. Explain the structure of standard form categorical syllogism.

Answer: A syllogism is a deductive argument in which a conclusion is inferred from two premises. A categorical syllogism is a deductive argument consisting of three categorical propositions that contain

three terms, each occurring twice in the two of the constituent propositions. A categorical syllogism is said to be in standard form when its premises and conclusion are all standard form categorical propositions. The conclusion of a standard form syllogism is a standard form categorical proposition which contains two of the syllogisms 3 terms. The term that occur as the predicate of the conclusion is called the major term and the term which occurs as the subject of the conclusion is called the minor term, in the standard form syllogism –

All men are mortal
All kings are men
∴ All kings are mortal

The term 'kings' is the minor term and the term 'mortal' is the major term the third term of the conclusion which occurs in both the premises but does not occur in the conclusion is called the middle term in our example, the term 'man' is the middle term. The premises of the standard form syllogism are named after the terms that appear in them. The major and the minor terms must each occur in a different one of the premises the premise containing the major term is called the major premise and the premise containing the minor term is called the minor premise in our example stated above, the major premise is All men are mortal and the minor premise is All kings are men. In a standard form categorical syllogism its major premise is stated first, the minor premise second and the conclusion last. It should be emphasized that the major premise is not defined in terms of the premise but as the premise that contains the major term and similarly the minor term is defined accordingly as it contains its minor term.

16. Write a note on the mood of syllogism.

Answer: The mood of a standard form syllogism is determined by the forms of the standard form categorical propositions, it contains. It is represented by three letters the first letter of which names the form of the syllogisms major premise, the second that of the minor premise and 3rd that of the conclusion. In our example stated below since its major premise is an A proposition the minor premise is also an A proposition and so also its conclusion, the mood of the syllogism is a comma for example,

A- All men are mortal
A- All kings are man
∴ A- All kings are mortal

17. Explain the figure of syllogism.

Answer: The mood of standard form syllogism does not completely characterize its form let us consider the two following syllogisms-

1. All great scientists are college graduates- A
Some professional athletes are college graduates- I
∴ Some professional athletes are great scientists- I

2. A- all artists are egoists
I- Some artists are paupers
∴ I- Some paupers are egoists

Both are the mood AII but they are of different forms we can bring out the differences in their forms most clearly by displaying their logical skeletons. Abbreviating the minor term by S, the major term by P and the middle term by M. The logical skeletons of these two syllogisms are-

1. All P is M. 2. All M is P
Some S is M Some M is S
∴ Some S is P ∴ Some S is P.

In the first the middle term is predicate of both the premises while in the second the middle term is the subject of both the premises. This, the mood of the syllogism does not completely describe the form of a syllogism. The form of a syllogism may be completely described by stating its moods and figure where figure indicates the position of the middle term in the premise it is clear that there are four possible figures a syllogism may have. The middle term may be the subject of the major premise and the predicate

of the minor premise or it may be the predicate of both the premises or it may be the subject of both the premises or it may be the predicate of major premise and the subject of the minor premise this different possible position of the middle term constitute the figure, first, second, 3rd and 4th figures respectively. This can be represented in the following way-

First. Second Third Fourth

MP. PM. MP. PM

SM. SM. MS. MS

∴SP ∴SP ∴ SP ∴ SP

Thus, a complete description of the form of any standard form syllogism can be given by naming its moods and figure.

18. What are the different forms of syllogism?

Answer: According to the nature of the constituent propositions from the point of view of relation, syllogism is classified into two, namely pure syllogism and mixed syllogism. A pure syllogism is that in which the constituent propositions are of same relation, for example,

All crows are black

This is a crow

∴This is black

Here, all the propositions are of the same relation, that is, all are categorical.

A mixed syllogism is that in which the constituent propositions are of different relation, for example,

If there is fever then there is rise in temperature

There is a fever,

∴There is rise in temperature.

Here, the propositions are of different relation, that is, the major premise is hypothetical and the minor premise and the conclusion are categorical.

19. What are the different kinds of pure syllogism?

Answer: Pure syllogism is of three kinds, namely,

1. Pure categorical syllogism

2. Pure hypothetical syllogism

3. Pure disjunctive syllogism

A pure categorical syllogism is that in which all the three propositions are categorical syllogism. A pure hypothetical syllogism is that kind in which all the three propositions are hypothetical proposition. A pure disjunctive syllogism is that in which all the three propositions are disjunctive propositions.

20. What are the different kinds of mixed syllogism?

Answer: Mixed syllogism is of three kinds, namely, hypothetical categorical syllogism, disjunctive categorical syllogism and dilemma. A hypothetical categorical syllogism is that kind of mixed syllogism in which the major premise is hypothetical proposition and the minor premise and the conclusion are categorical propositions. A disjunctive categorical syllogism is that kind of mixed syllogism in which its major premise is disjunctive proposition and the minor premise and the conclusion are categorical propositions. A dilemma is that kind of mixed syllogism in which the major premise is a compound hypothetical proposition, the minor premise is a disjunctive proposition and the conclusion is either categorical or disjunctive proposition.

21. State the rules of categorical syllogism.

Answer:- 1. A valid standard form categorical proposition must contain exactly 3 terms each of which is used in the same sense throughout the argument any categorical syllogism that contains more than three terms is invalid and is said to commit the fallacy of four terms.

2. In a valid standard form categorical syllogism the middle term must be distributed at least once in the premises the violation of this rule will commit the fallacy of undistributed middle.

3. In a valid standard form categorical syllogism if either term is distributed in the conclusion then it must be distributed in the premises the violation of this rule will lead to either the fallacy of illicit major or fallacy of illicit minor.

4. No standard form categorical syllogism having two negative premises is valid.

5. If either premise of a valid standard form categorical syllogism is negative, the conclusion must be negative.

6. No valid standard form categorical syllogism with a particular conclusion can have two universal premises full the violation of this rule will commit the existential fallacy.

22. What is perfect figure? why is the first figure called the perfect figure?

Answer : The figure in which the dictum de Omni et nullo is directly applicable to the moods is called the perfect figure. The first figure is called the perfect figure because the dictum de Omni et nullo is directly applicable to the moods of the first figure. This dictum lays down that –

a. The major premise must be universal and

b. The minor premise must be affirmative in the first figure only the major premise is universal and the minor premise is affirmative in all valid moods. Moreover, in the first figure only all the propositions, that is, A, E, I, O can be deduced as conclusion it is the only figure which proves A proposition.

23. Prove that from two negative premises no conclusion can be drawn.

Answer: A negative proposition is that in which the predicate is denied of the subject. If both the premises are negative then no relation between the major term and the minor term can be established. The major premise is negative this means that there is no connection between the middle term and the major term. Similarly, if the minor premise is negative then also there is no connection between the minor and middle term consequently if both the premises are negative then the major term and the minor term cannot be compared by means of the middle term, as a result, no conclusion can be drawn. For example,

No man are dogs

No cats are men

For the joint function of these two negative premises no conclusion can be drawn this combination leads to the fallacy of negative premises.

24. Prove that every syllogism must have three and only three terms.

Answer: The analysis of structure of syllogism shows that there are three propositions each of them is containing 2 terms so the total number of terms in a syllogism is 6 but all these six terms are not new terms only three are new and each used twice. So, in every syllogism there are actually only three terms, namely, major term, minor term and middle term. In every syllogism, a relation between the major term and the minor term is established in the conclusion with the help of the middle term now, an argument having more than three terms cannot be a syllogism for there will be no common element between the premises, for example,

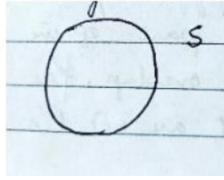
All men are rational animals

All chalks are white

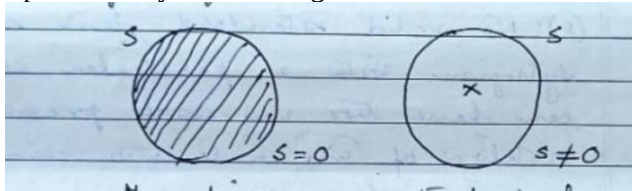
Here, there is no common bond or middle term. So it leads to the fallacy of photo terms again if an argument has only two terms it will be only repetition of the same proposition in the premises as well as in the conclusion. So in every syllogism there must be three and only three terms.

25. Explain the standard form categorical proposition with the help of Venn diagram technique.

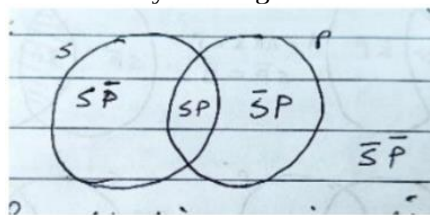
Answer – Standard form categorical proposition referred to two classes. Proposition can be expressed diagrammatically by diagramming the classes to which they refer. All class may be represented by a circle dwelled with the term that designate the class. Thus 'S' may be diagrammed as-



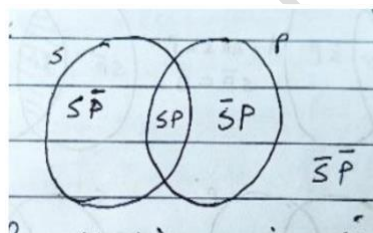
This diagram represents a class, not a proposition. To diagram that has no members, we shade all interior of the circle representing S. To diagram the proposition there are S's we place an X anywhere in the interior of the circle representing S. Thus the two proposition there are no S's and there are S's can be represented by the two diagrams are



To diagram a standard form categorical proposition two classes are required the framework for diagramming any standard form proposition whose subject and predicate terms are evaluated by S&P is constituted by drawing two intersecting circles is shown below –

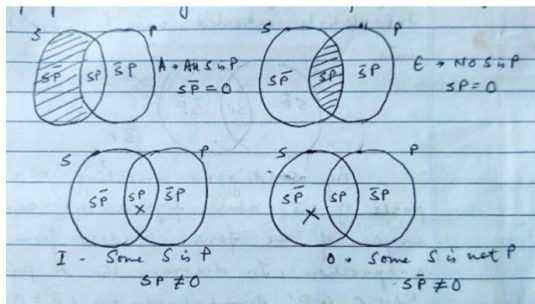


This figure represents more than two classes. The part of the circle levelled S that does not overlap the circle P diagrams all S's that are not P's represents the products of the classes S and P and the diagrams all things belonging to both of them is levelled as SP. The part of the circle levelled P that does not overlap the circle leveled as diagrams All P's that are not S's and represents the product of the class S is P and leveled as SP. Finally the part of the diagram external to both circles represents all things that are neither in S nor in P and diagrams 4th class leveled as S bar P bar. These levels inserted our figure stands thus –



By shading or inserting X in various parts of the above figure we can diagram anyone of the four standard form categorical proposition. To diagram the A proposition all S is P symbolized as $SP̄ = 0$, We simply shade out the part of the diagram that represent the class S P bar indicating that it has no members or is empty. To diagram the E proposition No S is P symbolized $SP = 0$, we shade out the part of the diagram which represents the class SP to indicate that it is empty. To diagram the I proposition Some S is P symbolised as $SP \neq 0$, we insert X into that part of the diagram which represents the class SP. This insertion indicates that the class product is not empty but has atleast one member. Finally for the O

proposition Some S is not P symbolised as $SP \bar{\neq} 0$, we insert X into that part of the diagram which represents the class $SP \bar{}$ to indicate that it is not empty, but has atleast one member. Now the four standard form of categorical proposition may be shown in the following way:



Unit 4

Symbolisation, Testing of validity by Truth-table Method, Shorter Truth Table Method for proving Invalidity

1. Symbolic logic is entirely formal in nature- is it true?

Answer:- Yes

2. Not is/ is not a logical constant.

Answer:- Is

3. Application of ideogram is /is not a characteristic of symbolic logic.

Answer- Is

4. Symbolic logic uses deductive/inductive method.

Answer:- Deductive.

5. If p is true and q is also true, what is the value of $\sim p \vee q$?

Answer- true.

6. 'v' represents conjunction/ disjunction.

Answer:- Disjunction.

7. Symbolize – 'If I have money and also friends then I can organize the function'.

Answer. $(p.q) \supset r$

8. Variable / is not a logical constant.

Answer :- is not

9. $p \vee q$ stands for either he will not attend the meeting or he will - Is it true?

Answer- no

10. Phonogram stands for sound.

11. Ideogram stands for sound/concept.

Answer:- concept.

12. A variable is/ is not a symbol

Answer:- Is.

13. Illustrate variable.

Answer- p,q,r,s.

14. Symbolize 'he is neither intelligent nor industrious'.

Answer- $\sim p \vee \sim q$

15. Find the value of $\sim (\sim q \supset \sim p)$, if truth is the value of both the variables.

Answer :- $\sim (\sim q \supset \sim p)$

$= \sim (\sim T \supset \sim T)$

$= \sim (F \supset F)$

$= \sim T$

$= F$

16. What is symbolic logic?

Answer:- Symbolic logic is the name given to that part and the method of treatment of formal logic which is comparatively of recent origin and in which specialized symbols are used extensively to express the arguments as to determine their value in a better and easier way.

17. What is symbol?

Answer:- Symbol is a sign which is consciously designed to stand for something, for example, the national flag of a nation is the symbol of that nation.

18. Define variable.

Answer:- Generally variable means changeable. In logic variable means a symbol which can stand for anyone of the given range of values. Variables are those symbols which do not have any fixed meaning. They can be given any range of values.

19. Define constant

Answer: Logical constants are those symbols which exhibits the form of compound proposition and which bears the same meaning in the symbolic expression of proposition the following are the logical constants.

Negative (not) – ‘ $\sim$ ’ (curl)

And- ‘ $\cdot$ ’ (dot)

If... then – ‘ $\supset$ ’ (horseshoe)

Either... or – ‘ $\vee$ ’ (vel)

Equivalence (if and only) – ‘ $\equiv$ ’ (three bar)

20. Define classical logic.

Answer:- Classical logic is the name given to those parts and that method of treatment of formal logic which have come down substantially are changed from classical and medieval time.

21. What is the relation between symbolic and classical logic?

Answer- 1. Both the two systems are concerned with forms and validity of arguments.

2. Modern logic is the development of concepts and technique which were implied in the work of Aristotle, the founder of classical logic.

22. What is called a truth value of a proposition?

Answer:- Truth or falsity is the very essence or character of a proposition. The truth or falsity of a proposition is called its truth value.

23. What is to table method?

Answer- The method or technique in which the truth table are used to determine the validity or invalidity of an argument is called the truth table method.

24. What are the two different types of symbol?

Answer- Symbols are of two types, namely verbal and nonverbal. Different words used to indicate substance, quality, action etc are called verbal symbols, for example books, honesty, come, etc. Different letters such as p, q, r, s etc or mathematical symbols such as +, -, ÷, × etc are nonverbal symbols. The nonverbal symbols are used in symbolic logic.

25. Distinguish between sign and symbol.

Answer- Symbol & sign differ. It is not easy to draw a hard and fast line between the two. Sign may be natural or artificial but symbols are always artificial. Smoke is the sign of fire because there is natural and necessary relation between smoke and fire but symbol is that sign which is used consciously to indicate something. The national flag is a symbol of a nation. It is consciously designed. Symbols are predetermined artificial sign which is not always in the case of sign.

26. Distinguish between phonogram and ideogram.

Answer: Ideogram are those symbols which stands directly for concepts, for example multiplication sign 'X' and such other signs are ideograms. Ideograms are often contrasted with phonograms. Phonograms are signs which stands directly for sounds and indirectly for concepts, for example the written word 'multiplication sign' is phonogram. Unlike the ideograms the phonogram represents spoken English words which correspond to them while phonograms refer to the words in language which are written according to some sorts of phonetic rules, ideograms refers to the concepts or the ideas represented by the words.

27. What is truth function?

Answer:- A truth function is a compound expression where the value of the expression is determined by the value of the constituent variables the value of the statement or compound expression is determined as soon as the truth value of the constituent variables are known, for example the statement form $p \vee q$ is a truth function because the truth value of the expression is determined by the truth values of the two constituent variables p and q.

28. What is it truth table?

Answer: Truth table is a convenient way to show the truth values of a truth function taking into consideration all possible truth values of a propositional variables involved in it. So the truth table is a definition of the truth function the compound sentence 'p and q' is called a truth function of its component sentences p and q because when we know the truth value of the compound sentence is thereby determined the tabular way of representing the dependence is called a truth table.

29. What is proposition?

Answer:- A proposition is a sentence or combination of sentence which is either true or false, for example Ram is a boy, $5 + 2 = 7$ etc. Similarly, Ram is not a boy, $5 + 2 = 10$ etc are propositions because the properties of truth and falsity can be meaningfully applied to such statements. On the other hand, a property of truth and falsity cannot be applied to the statement “do you know him?”, this statement is therefore is not a proposition.

30. What are the two kinds of proposition?

Answer:- Propositions may be divided into two kinds, simple and compound. A simple proposition is one which consists of a single statement, for example you study hard, this can be symbolized as ‘p’.

A compound proposition is one which contain two or more statements as component, for example Ram is a boy and Sita is a girl this is symbolically expressed as ‘p and q’.

The following examples show the way in which various statements are joined and negated to form a compound propositions-

1. If you read then you will pass.
2. Either he will come or she will come.
3. You worked hard and you passed.
4. It is false that you worked hard.

Now the meaning of the above propositions is ignored the symbol p and q are used for the first and second statement then the proposition can be symbolically expressed in the following way-

1. If p then q
2. Either p or q
3. p and q
4. not p

31. What do you mean by tautology or tautologous proposition?

Answer- The tautologous proposition is that kind of statement which is true under all conditions. The truth of such proposition is independent of any experience, for example he is a philosopher. The truth of the proposition can be known without any experience. The proposition is necessarily true. The statement form of tautologous proposition is ‘ $p \vee \sim p$ ’. To show that the statement form is a tautology let us construct the following truth table-

p	$p \vee \sim p$
T	T T F
F	F T T

As there is only one variable so there are only two rows. In the conclusion column of this two table there is only T’s this fact shows that all of the substitution instances are true that means this statement form is tautology.

32. What do you mean by contradictory proposition or contradiction?

Answer: A contradictory proposition is that kind of statement which is false under all conditions. The falsity of such proposition is also independent of any experience, for example, he is and is not a philosopher. The falsity of the proposition can be known by itself independent of any statement form of

contradictory proposition is $p \cdot \sim p$. To show that the statement form is contradiction let us draw the following truth table-

p	$p \cdot \sim p$
---	------------------

T	T F F
---	-------

F	F F T
---	-------

In the conclusion column of this truth table there is only F's. This fact shows that all of its substitution instances are false that means this statement form is contradiction.

33. What do you mean by contingent proposition?

Answer:- A contingent proposition is that kind of statement which is true under such and such condition. The truth or falsity of this kind of proposition is verified on the basis of experience only. Contingent proposition is not necessarily true, for example Ram is a boy and Romi is a boy. The truth or falsity of this proposition is not self-evident, experience can only prove that the statement form of contingent proposition is ' $p \cdot q$ ', ' $p \vee q$ ', ' $p \supset q$ ' etc. To show that this statement form is contingent, let us draw the table of the following

P	q	$p \cdot q$
---	---	-------------

T	T	T
---	---	---

T	F	F
---	---	---

F	T	F
---	---	---

F	F	F
---	---	---

As there are two variables so there are four rows. In the conclusion column there are T&F both. This fact shows that this statement form is contingent as its truth value is dependent on its content rather than its form alone.

34. What is the nature of symbolic logic?

Answer- 1. Symbolic logic is a branch of logic. It is of recent origin. It is only about 180 years old as the first statement of symbolic logic as an independent branch appears in the books written by Augustus de Morgan and George Boole.

2. Symbolic logic is also concerned with the forms and validity of arguments like that of classical logic.

3. Symbolic logic uses symbols extensively because according to symbolic logicians, by use of spatial symbols validity or invalidity of arguments can be easily and clearly determined.

35. Distinguish between classical logic and symbolic logic.

Answer – 1. In classical logic symbols were used to a limited extent whereas in symbolic logic symbols are used extensively.

2. Modern logic clearly draws a distinction between inference and implication, in traditional logic this distinction was not clearly made.

3. Regarding the analysis of proposition in classical logic every categorical proposition is regarded to be the statement of certain relation between two terms. In modern logic, a proposition need not be two termed proposition.

4. The classical logicians thought that the copula alone is capable of expressing all types of relations. Modern logicians recognize various types of relations such as symmetry, transitivity etc.

5. Again regarding the classification of proposition the classical logic classify proposition into two types, namely categorical and conditional. Modern logicians in contrast, classified propositions into simple, compound and general. Further, on the basis of the idea of truth functionality, propositions are classified into tautologous, contingent and contradictory.

36. What are the characteristics of symbolic logic?

Answer- According to a distinguished American philosopher, C. I. Lewis the basic characteristics of symbolic logic are as follows:-

1. The use of symbols: The first basic characteristics of symbolic logic is the use of special symbol, for example '?' is ideogram but the written word 'question mark' is phonogram. It directly represents the spoken English which corresponds to it and not concept. According to symbolic logicians, the symbols have certain advantages, such as symbols bring out clearly the forms of arguments for which it become easier to divide arguments into valid and invalid.
2. The use of deductive method: The second basic characteristics of symbolic logic is the use of deductive method. In the deductive method from a limited number of statement we can produce an infinite number of other statements. Symbolic logic implies this deductive method and in this respect symbolic logic is quite close to mathematics.
3. The use of variables : The third basic characteristic of symbolic logic is the use of variables. Generally variable means changeable in logic variable is a symbol which can stand for anyone of the given range of value.

37. Write a note on importance of using symbols.

Answer- 1. The use of symbols exhibits the logical form of the argument and thereby helps to classify them according to their forms so that their validity can be determined through the application of general rules.

2. The use of symbols help to express the generality of the logical rules.
3. The use of symbols give conciseness, clarity and economy of expression to complicated statements and arguments which would be practically unintelligible when expressed in ordinary language.
4. The use of symbols help to express conveniently the concepts and technical terms which are peculiar to logic. Further symbols like variables are also useful to represent different logical operation.
5. The use of symbol helps to safeguard the argument from the influence of the material truth or falsity of the constituent proposition which create difficulties in the determination of its validity.

38. Why do you symbolize ordinary language?

Answer- An argument contain proposition as its premises and conclusion. Arguments as expressed in ordinary natural language are often difficult to appraise in their proper form on account of the vagueness and ambiguity of the words, the misleading idioms etc With the view to resolve difficulties of ordinary language the logicians have introduced the artificial symbolic language. Hence, in symbolic language one important task is the symbolization of propositions and argument stated in ordinary language. In order to symbolize proposition and argument as expressed in ordinary language it is necessary to have a clear knowledge about proposition. However, it is also necessary to discuss clearly about the symbols- how and what type of symbols ought to be used, how proposition and their mutual logical relationships can be expressed adequately with the help of such symbols.

39. What points are to be noted about logical constants?

Answered- 1. Every compound proposition is formed by means of logical constants from simple propositions. The basic elements of any compound proposition, however complex are simple propositions and the logical constant form the compound proposition from the simple ones.

2. Every logical constants with exceptions of 'not' (negation) is known as logical connective because such logical constants form the compound propositions by connecting simple or other compound propositions.

3. Each connective connects two and only two propositions.

4. 'Not' or 'it is false that...' (negation) differs from other logical constants. Although it is a constant and extremely important one. It is not accepted as connective by some logicians that it does not serve to connect two propositions. But it is like other constant that it serves to form compound propositions from simple propositions by negating the simple proposition. In this sense, some other logicians accepted it as a connective.

40. Explain the truth functions of conjunction negation, disjunction, implication and equivalence.

Answer- The truth table of a compound proposition depends upon the truth value of a simple proposition out of which it is composed. The compound proposition is called a truth function of its component simple proposition for, the word or by which the simple propositions are joined together to form a compound proposition is called connective the words like 'and', 'not', 'either...or', 'if... then', 'if and only if' are propositional connectives.

The first type of connective Is conjunction. We can form the conjunction of two statements by placing the word 'and' between them. The statement so combined are called conjuncts. We produce '.' (dot) as our symbol for conjunction thus 'p' & 'q' any two statements whatever their conjunction is written as 'p.q'. The truth value of the conjunction of two statements is determined wholly by the truth value of its two conjuncts there are only four possible cases and the truth value of the conjunction in each are as follows which is represented by means of a truth table -

p	q	p.q
T	T	T
T	F	F
F	T	F
F	F	F

The negation or contradictory of statement is often formed by inserting a 'not' into the original statement. For negation we use the symbol '~' (curl). The negation of any true statement is false and the negation of any false statement is true now this fact can be represented by means of a truth table - -

P	~p
T	F
F	T

A disjunctive truth function of proposition and compound proposition in which two propositions are joined together into one by the symbol 'v' (vel). The two component statements so combined are called disjuncts. The Latin word 'vel' signifies inclusive disjunction and we use the letter 'v'. The word 'vel' signifies 'or' in this sense where p and q are any statement whatever, their inclusive disjunction is written as 'p v q' . This can be represented by the following two table-

p	q	p v q
T	T	T
T	F	T

F	T	T
F	F	F

A compound proposition can be obtained by the help of connective 'if..... then'. A compound statement so obtained is called implicative function of the compound proposition. If p and q are two statements 'if p the q' is an implicative function of the truth table of p and q. For 'if...then' we use special symbol ' $\supset$ ' (horseshoe) and thus 'if p then q' is symbolized as ' $p \supset q$ '. The implicative function of $p \supset q$ is false when p is true and q is false. This can be represented by the following truth table –

p	q	$p \supset q$
T	T	T
T	F	F
F	T	T
F	F	T

An equivalent function is true only if p and q are either both true and both false otherwise it is false. $p \equiv q$ is an equivalent function. Here, there are two variables, so there will be four possible combinations of truth values its truth table may be regarded as the definition or formula of equivalent function . The tabular form of these-

p	q	$p \equiv q$
T	T	T
T	F	F
F	T	F
F	F	T

Unit 5

Formal proof of validity (9 rules of Inference)

1. What do you mean by formal proof of validity?

Answer- A formal proof of validity for a given argument is defined to be a sequence of statements, each of which is either a premise or that argument or follows from preceding statements by an elementary valid argument and such that the last statement in the sequence is the conclusion of the argument whose validity is being proved. We first define an elementary valid argument as any argument is a substitution instance of an elementary valid argument form.

2. What is the formal way of writing out the proof or validity?

Answer- A more formal and more concise way of writing out this proof of validity is to list the premises and the statement deduced from them in one column with justification for the letter written beside them each case the justification for a statement specifies the preceding statements from which the rule of inference by which the statement in question was deduced this convenient to put the conclusion to the right of the last premises separated from it by a slanting line which automatically marks about it to be premises.

3. Illustrate an elementary valid argument.

Answer - Any substitution instance of an elementary valid argument form is an elementary valid argument thus, the argument

$\sim C \supset (D \supset E)$

$\sim C$

$\therefore D \supset E$ is an elementary valid argument because it is a substitution instance of the elementary valid argument form Modus Ponens (MP). It results from

$p \supset q$

p

$\therefore q$

But substituting ' $\sim C$ ' for p & ' $D \supset E$ ' for q therefore it is of that form even though Modus Ponens is not the specific form of the given argument.

4. Why are the 9 rules of inference called elementary valid argument forms?

Answer- The nine rules of inference are elementary valid argument forms whose validity is easily established by two tables they can be used to construct formal proofs of validity for a wide range of more complicated arguments. The names listed are standard for the most part and the use of their abbreviations permit formal proofs to be set down with a minimum of writing.

5. Why do we use the formal truth of validity?

Answer- If argument contains more than two or three different simple statements or components, it is tedious to use through tables to test their validity. More convenient method of establishing the validity of some argument is to deduce their conclusion from their premises by a sequence of shorter, more elementary of arguments that are already known to be valid. Consider, for example, the following arguments form in which there are five simple statements

$A \vee (B \supset D)$
 $\neg C \supset (D \supset E)$
 $A \supset C$
 $\neg C$
 $\therefore B \supset E$

To establish the validity of this argument by means of a truth table would require a table with 32 rows. We can prove the valid argument valid however by a sequence of just four arguments whose validity has clearly been established by using the rules of inference

1. $A \vee (B \supset D)$
2. $\neg C \supset (D \supset E)$
3. $A \supset C$
4. $\neg C / \therefore B \supset E$
5. $\neg A$ 3,4 MT
6. $B \supset D$ 1,5 DS
7. $D \supset E$ 2, 4 MP
8. $B \supset E$ 6, 7 HS

Rules of inference-

1. Modus Ponens (MP)

$p \supset q$
 p
 $\therefore q$

2. Modus Tollens (MT)

$p \supset q$
 $\neg q$
 $\therefore \neg p$

3. Hypothetical syllogism (HS)

$p \supset q$
 $q \supset r$
 $\therefore p \supset r$

4. Disjunctive syllogism (DS)

$p \vee q$
 $\neg p$
 $\therefore q$

5. Constructive Dilemma (CD)

$(p \supset q) \cdot (r \supset s)$
 $p \vee r$
 $\therefore q \vee s$

6. Absorption (ABS)

$P \supset q$
 $\therefore p \supset (p \cdot q)$

7. Simplification (simp)

$p \cdot q$
 $\therefore p$

8. Conjunction (conj)

p

q

$\therefore p \cdot q$

9. Addition (Add)

p

$\therefore p \vee q$

ANJANA'S