Introduction To Logic
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Module No-01
Semantic Tableaux Method : Further Example
Lecture no-21

Welcome back, in the last class we introduce semantic tableaux method and using semantic tableaux method, we have seeing how to show a given well form formula in the preposition value is valid are any 1 show, when 2 groups of statement of consistence to each other are can even show, when 2 well form formulas in prepositional logical set to be logically equivalent to each other and these are the thinks which we have seen. So, in continues to last class, where we were studying some of the puzzle in particle.

So, you're trying to solve some of the puzzle using semantic tableaux method. So, in this class we will focus on attention meanly on solving some of puzzle, which include knight and knave puzzle, which are cocked up by a famous logician remands million.

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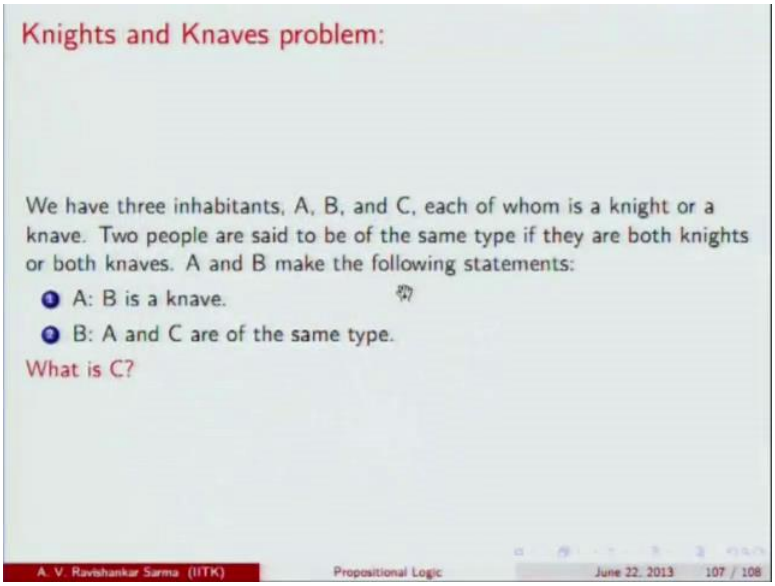

So, in continues the last lecture, we a left at this particular stage that, here is the problem which your trying to solve. So, knight and knave puzzle are like this. So, imagine a

situation way we want to a kind of an islands, were they are only 2 kind of inhabitants. So, they either they only speck to truths or they only tales likes for example, we ask them in 2 pulse 2 is equal to 4 the knives, will tell that it is false. If you ask it so, happen at the independent in knight, then if asked them is 2 pulse 2 is equal to 4 the answer would be yes, because they always tell truths. So, this are the only 2 kinds of inhabitants and the rules of the game is like this that, a nave can never tall truths for example, if I am liar, I am not tell truths, if I tall truths then i am longer to consider to liar and all it goes to again the definition of, what you mean by lying?

So, that is 1 think in a liers cannot tall truths. So, layer cannot tell lince and the other thinks is that knights always speak through and knave tales likes. So, now, you're a stranger and a we want to such kind of island, then you come across some kind of a inhabitants and your asking what tear what kind of tear. Now, you come across assume that they are 2 inhabitants ABC and problems go to like this. So, now, you ask A then A said B is a knave and you ask B and then E said it is taking about A and C; ABC are 3 kinds of people and in home. So, b saying about A and C like this. B says A and C is the same time; that means, either they are knaves semantic, either they might be knights.

So, now, given this piece of information. How we do know what types C is. So, this problem can solved by using truth table method, we can solve it by using some other kind of reasoning, that reasoning goes like this. So, in all this knights and knaves problems, usually the ordinary way of solving the in this problems is simply like this.

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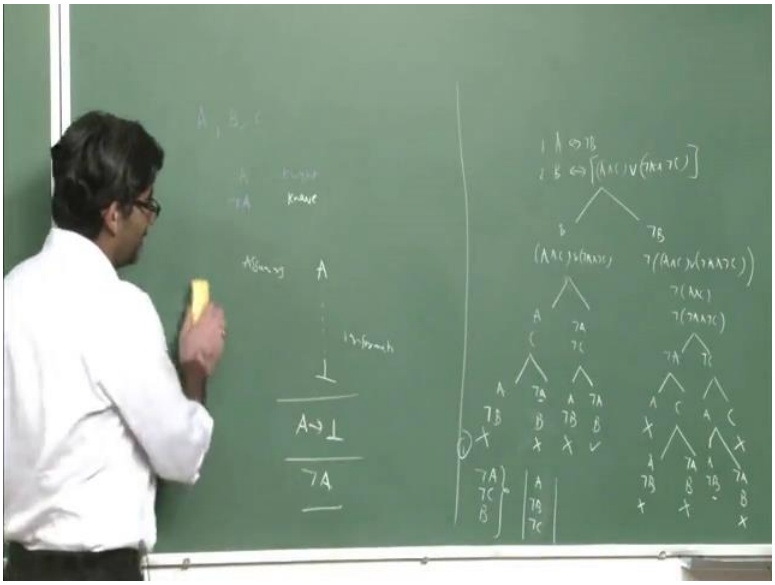

First you assume this are the ABC in all and what will you do is you have assume some think another in the beginning, suppose if you assume A is knight and all. So, the represent remains is in same and all if I write simply a; that means, a is knight, suppose if I write not a; that means, A is consider to B knave. So, there are now other kinds of inhabitants exist in this word either they only tells truth, the only tell lies and all; it is not the case that somebody tells you neither true nor falls. Thread value does this like this movement; say in all this problem that we are going to study in this class.

So, now, 1 way of solving this problem is assuming a kind of reduction as of ups and down method of which he will use. Assuming that, A is knight and then you take all the piece of information that is there in the puzzle and then ultimately you will show that there is contradiction of you will arrive at some think contradiction. So, by taking the information in the puzzle, then what you will to say is since assuming that A leads to contradiction, this symbol stands for contradiction. Then what you will do is, it is not a is it you assumption is correct, there means it as to be not a rather than A. So, in that since you will show that is a knave and all by assuming a something A is knight, if you come cross the contradiction he will show that is not A.

So, once you find out, One particular kind of inhabitant, what is any 1 substitute in to the

piece of information and then you will try to figure out what are the other kinds a people. What type what type the other belongs to they are knaves and knights are etcetera. So, there is the anther way, which you can solve this problem that is the truth table method. So, which is not going to the details of this 1, but we have studied are semantic tableaux method in greater detail. So, we will be solving this problem using semantic tableaux method.

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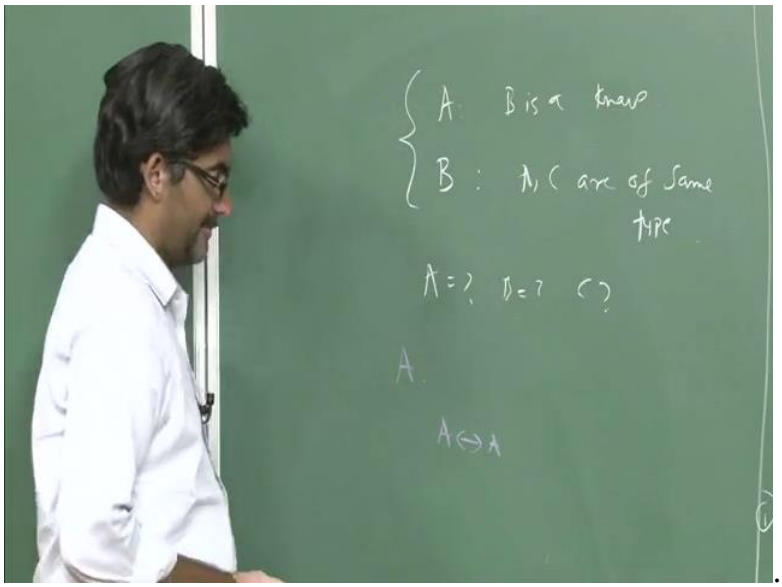

So, now, the problem is like this A says B is a knave and then B says this particular kind of think. A and C are of same type .So, now, based on this particular kind of information how do we know that what are A B and C. So, the 1 of the ways to solve this problem in like this. So, suppose if says that he is a knight, then usually the represent it as this 1. A says that a is the knight; that means, A if an only if A; that is the way to represent is particular kind if problem.

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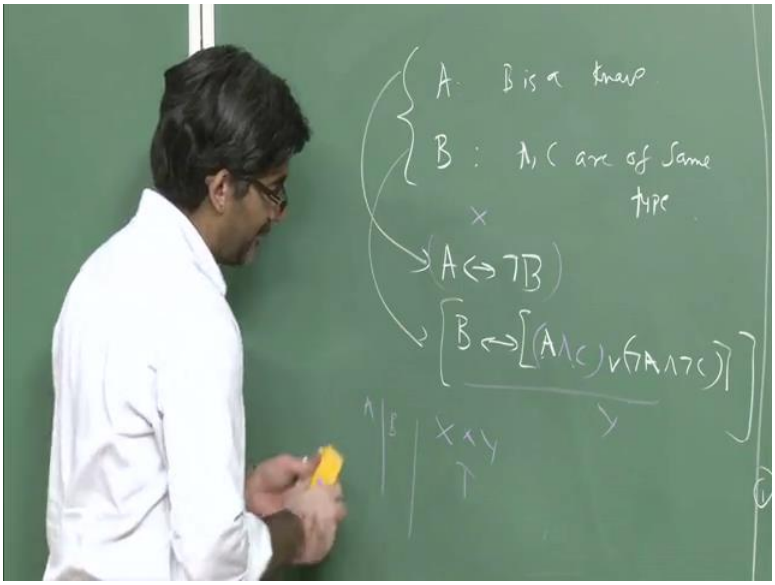

So, now, this problem can be represented as this. A the first 1 B is a knave; that means, it has to be negation of B that stands for the first statement. Now, the second statement his represented as this thing B says; that means, B if an only if then this is the 1, A and C are of same type here, there are 2 case which in a taking to consideration. So, a and c are of same type means, either thy can be both knight and they can be both knaves also; that means, in he to take into consideration this possibility, either both are knights or both can be knaves no knaves are presented with negations.

So, the back at needs to be the properly now this is the second formula. So, now, we need to figure out under what conditions these 2 are sententiously true or what are what makes this think satisfaction able, are what make this true 2 statements true. You can solve it with the help of truth able method by contracting a you will take this as x and this as y and then you contract a truth able x an y and then, you will see wherever you find T is and all that row, he need to inspect and then; that means, that is the row that row that is is going to satisfy these 2 formulas. And that row we need to inspect and then you can find out, you can go back and find out what are A is and Bis in this particular kind of row.

So, that is 1 way of solving the problem, but we are trying to solvent with the help of

semantic tableaux method. So, now, this is the first 1 which we have represent it A, if an only B and not be and B says that, both are of same type, that is A and C are it should be not A and not C. So, now, we will be using some kind of alpha and beta rules 2x to consistent 3 for this 2x.

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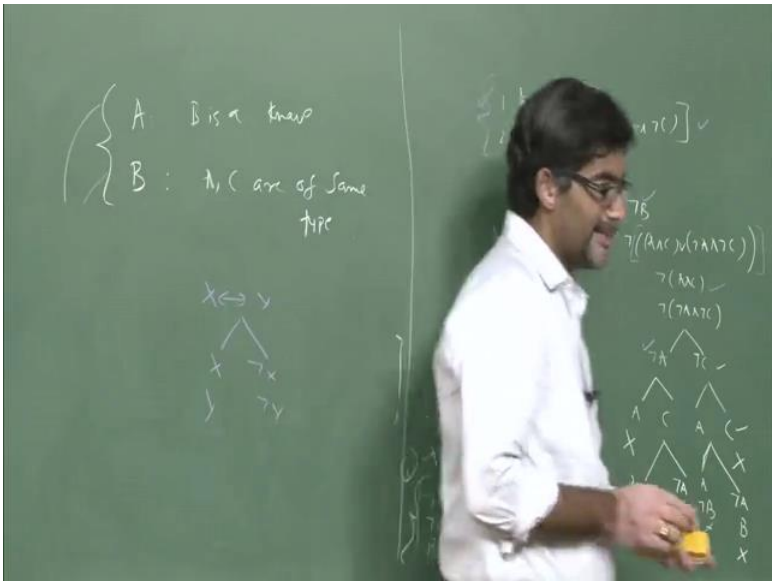

So, now, we are opening this formula first. So, that is for example, if we have a formula x implies y, then what we do, is you expand the tree in this way either x and y is the case are not x and not y. So, that is 1 of the possibilities and all. So, now, you list load B as it is, B A and C are not A and C as it is. So, now, this is the 1, first 1 and you negate this literal an you have to b get the other 1 of not x and not y, not of all this thinks now. So, now, you further example this tree in all. So, this is A and C and not A and C. So, A and C actually it should be like this, A and C now, this further expanse to AC.

So, now, we have not A and not C his expanse to not A and not C. So, now, there is no way, which we can to close the branch and all we know because we do not know a literal and its negation at this movement. So, now, we further expanse it with this thing. So, on the other hand, we have not of this 1 first, negation of this junction is a conjunction that is say we have return 1 after the other 1. So, it is not of this particular think, not of this 1. So, now, you expand this particular kind of negation of conjunction is a disjunction that

is way, we have a branch here, a branch here, it is not a first 1 not A are not C. This is the 1 which have return for this. So, now, we farther expand with help of for this 1, not of not A an not C that is negation of design and conjunction his a disjunction this will have branch here, negation of A is a negation of negation C and the in same way, a same information which he put it in the other branch, which is open again A and C. At this movement he need to see wither, we have literal a negation; that means, if there is any computing information present are not. So, now, we have A here and not A here is branch closes hoer and then its branch is still open. Now, we have A here and off course is branch is also opened your C here and now not C here.

So; that means, the branch closes here itself is it as to expand this particular branch. So, now, the both this formula are check down, we are simplifying this formula an on. So, now, you write for this 1. So, this is x in pulse y x, y and not x and not y so; that means, this is simply A and not B and then negation of this 1 is not A and negation of B is B. So, that is what we have to written, again the same think needs to be written for the open branch here, this branch is open. So, that is say we need to right the same information for this 1. A not B same information not A and B; we finished the branch are now because we are we ended off with only automatic propositions.

So, there is no rules can be no father rules can be applied here. it is tops here itself because the end of the branch is considerably here and automatics sentence, no father rule can be applied. So, his branch NCR now, we need to inspect weather, a literal and negation is present he needs branch, that is means; completing information is present are not in the given branch. So, now, here, I we have not be here and so, this branch close it itself need at we very much this is the 1, which need to inspect A and not B and all the way up here, we have not a here and A here so; that means, his branch closes. So, now, the same way we have B here down tree and all the way up here we have not B. So, that is means this branch of also closes.

So, now, this branch remains open because that is no confuting information. So, now, this is the open branch, which he need to inspect. Now, here also we have B here and not be here the branch closes. So, this is about the right side now we need to see about that left hand side. In the left hand side, we have here, he will see clearly here, we know B

here and not B here, that is why, this branch closes. This mark represented the closer of the branch, we can represent it will any other mark an all in does not matter, but we put cross an no. So, we cannot farther extend. It is like, you're sitting on a branch of a tree and you're cutting that branch you know. So, cut the tree, then there is no way which we can move for over.

So, move forward here going to fall into something like that or in logicians terms we have falling in some kind of help. Help because, this are in consisting information in all, in consisting is contact to be help for the logicians, why because if have in consisting statement, you can derive any think, any strange kind of think using that principle of logic. So, all principle of logic a through preserving and in you use same kind of the modern spoon etcetera and are we can derive any strange kind of propositions, that is regain why logician will het to have in constance you know.

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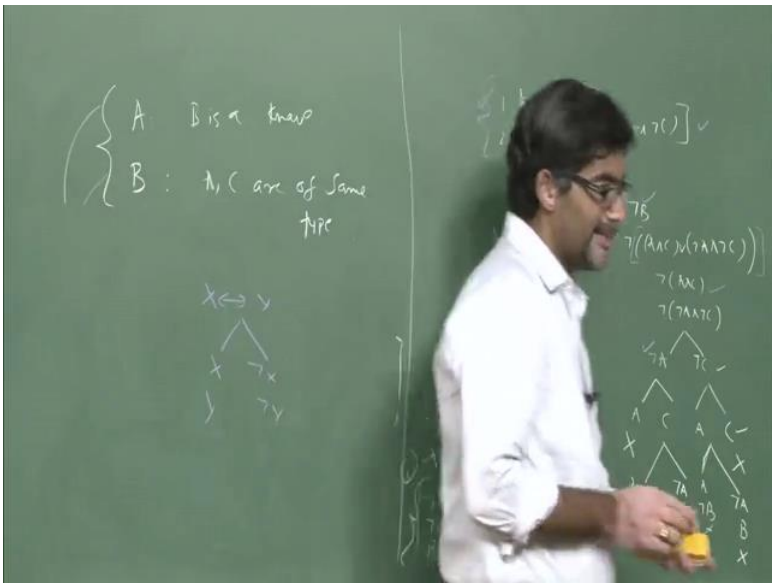

So, now we have on the 2 open branch in on and open branches are the once, which nukes this formula through, I mean, this 2 formulas simultaneously true, that is satisfieable. So, this is a interpretation under which, these 2 formulas are going to be true; that means, satisfiable. So, on the 1 hand you need to inspect here, you have not A here, that is what we have listed here and then B is the 1 which we have listed here than

whatever is that not C is the 1, which we listed out here. So, this is 1 particular kind of solution so; that means, if A says B is a knave and B says A and C of same type, now A and C now, there of the same type so; that means, A has to be knave and C has to be knave; that means, they are of the same type.

So, that is what B is same. So, now, this is 1 possibility in another possibility is that either A as to be knight and then, both B and C have to be same type not B and not C. So, the solution of this problem this, when B say that AC are the same think and that seen to be satisfying this particular kind of solution so; that means, A and C as to be knaves and B as to be knight. So, this is the way, in which we are we can solve this particular kind of problem. We will consider same more problems in little bit in grated detail little bit latter, but before that he will consider some interesting problems, which we began with a in the being of this course, being of this lecture on preposition logic.

So, he will go back to that particular kind of think and he will see how to solve this particular kind of problem. So, this is the 1 which will be looking into he began with a very interesting problem that is, this think.

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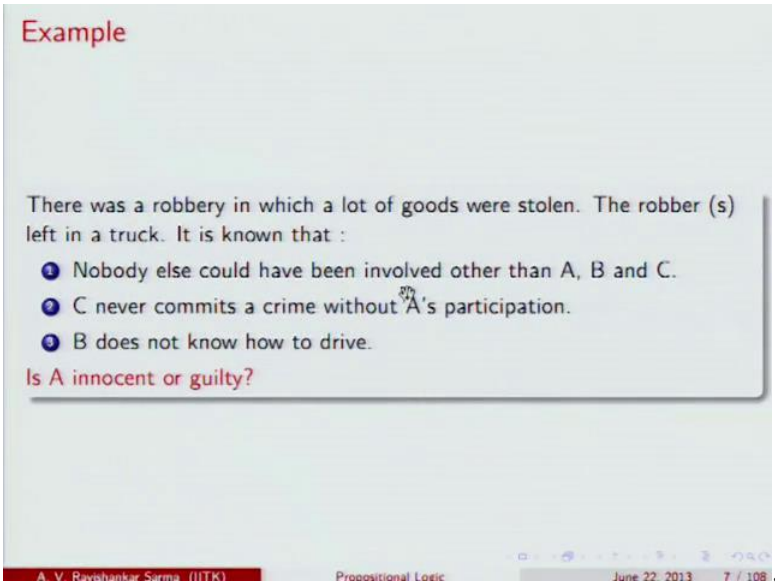

So, intrude of doing this logic course in with all freedom etcetera on the interesting in

certain way, but we are trying to include as many as much as possible. So, the interesting problems at we come across in today discourse. So, he raise the it is the interesting problem, which we began with an then, a detective is trying to find out how as to committed this particular kind of. So, the problem goes like this, there was the robbery in which some goods are stolen. I mean lot of goods are stolen that a we are varied about it.

So, now, the robber let S, left the truck after sealing all the stuff and all, they flue in a truck with help of truck they flew in the way. So, the information that we have at list we have this pies of information and from this pies of information he need to find out how has to committed his crime, or how his innocent and who is guilty in. So, the first statement say that, no 1 else could have been involved other than ABC. Somehow, you could figure out that only ABC are involved in particular kind of tuft and robbery; no hence in involved in that 1 your seen screen people flying the are 3 people are living in a truck .

So, now, the second statement is this, see never commits a crime without A's participation let means, were aver see goes see will take A in particular. So, see as lot of faith and A maybe see, A is consider with friend of him are see sure that, whenever a is there in commits the crime effectively. I mean, theft effectively etcetera. Let mean see never, commits any crime without the help of is participation; that means, were aver see in the A will always we there. So, now, the third data of information, that we have is this B does not know, how to drive that mans, be cannot drive the truck an know. So, B does not know how to drive?

So, that information also we somehow have. So, now, given this piece of information we need to find out who is guilty, when that mean, weather he is innocent or guilty. So, now, again this problem can be solved in n number of ways. So, 1 is this that we can assume same think, someone is guilty, then he show that using reduce and opsedam method, someone we come to this conclusions that, A contradiction A leads to contradiction then; obviously, you say that not is case that, is 1 way of solving of it hour can process this information in your main then, ultimately we can come out with your luck we come out with a answer, but thinks would be relatively easier once we represent to this pics of information into, some kind of language very you can some kind of language you called

as carbolic logic are carbon are preposition logic.

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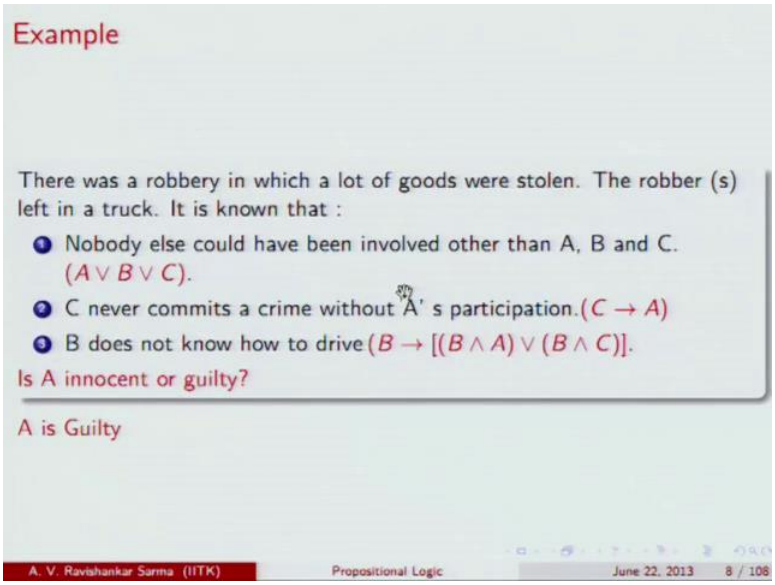

So, now, this piece of information we can represent in this way, and then we can find out a who is contract to be guilty. So, now, the first 1, first statement is that, no 1 else could involved other than ABC. So, this can simply translated are as A or B or C. So, we are note that, this is the problem which we began with when before entering in to the preposition logic this is the 1 of the motivating example, which we are taking in to consideration, but that time, we do not have semantic tableaux method, truth able method are to be left it them.

So, now we are taking it out and then we trying to solve this problem, using semantic tableaux method. So, now, the first statement his translated in to A are B are C, we can no other person his involved it D is not this. So, that A and B areas. So, now, this second 1 is this think C, never commits a crime without A's participation so; that means, presents of C is important for, sufficient for A is involvement in the crime in all; that means, it is C in simplifies A. So, and the third 1 is b does not how to drive; that means, is B is a person then a; obviously, it has to be uncompleted with either A and it as to be a uncompleted C. Then only, you can flue 1 he can a kept from the C; the robbery seen otherwise, he will be cotton all. So, either you have take the help of a as you have take

the help of C.

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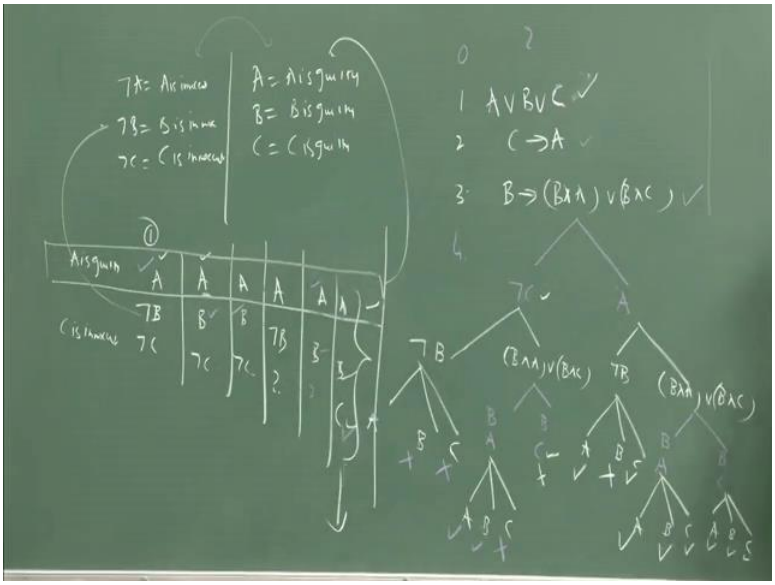

So, now, given piece of information of again he will draw a kind of semantic tableaux 3 for this 1. And then, he will see whether we can solve in this problem are not. So, now, the first information his A or B are C; first he will list of all this think, then he will C weather we can solve this particular problem are now. So, now, the third 1 is B implies B and A or B and A are B and C B always to be a completed with C, then only we can run away otherwise, there is no way in which, you cannot drive to the car, we cannot drive the car truck are say will be cotton. So, so this is the piece of information that, we have. So, now, the question is whether A is guilty or large. So, this before solving the problem, we need to come of its some kind of representing.

So, in this problem I am taking in to the consideration A means, A is guilty and B is guilty etcetera. Guilty means yes, committed crime and that is the regain C is guilty. So, now, exactly opposite of that 1 is what you mean by, this A is innocent. So, not B, B is innocent and not C transfer to, C is innocent. Suppose, if you not compatible with this negation etcetera as on usually he will say, guilty means not A; that means, innocent means a clean. So, that says A. So, in that since, what we need to do is you can inter change this 2 thinks on and with represent it first. Suppose, if a represent A is innocent

know this formula will be come not A are not B are not C.

So, that is the only difference here and intrudes of C will have not C and not A, because what we mean by, innocent A is innocent here, per you is this 1 rather, than this particular kind of negation. So, I am taking in to consideration A means, A is guilty B means B guilty and off course, not A means, A is innocent. So, now, once you represent this formula in terms of represent language preposition logic, then you will come in to know a detective. Let a say, is try to find out is trying to the club of this information and he trying to find out who is guilty and who is not guilty. We can process is information in your mind and there have to work in lot a all so, the coming of in this kind of solution in this particular there kind of problem.

But once he will represent it in terms of some symbolic language like this and if you information is correct then; obviously, we can come off with here solution. So, now, for given what a b c etcetera and all know. Now, we will process information an using this semantic tableaux method. So, now, this is the pies of information, now we need to figure out anther what conditions this is going to be satisfabel he constructatory and you will come to know when this 3 kinds of statement are through. So, now, we will open up this branch in all. So, first any formula you can use we will open up this particular kind of formula that is, it is not C and A because x in pulse y not x and y.

So, now, this is the over we check this formula. So, that is done taking care of now, second think which we will do is in this 1. This is not B and then the same formula which write B and Ar B and C. So, now, the same information you write it in the other branch we he open. So, now, this is a gained same think now, this is B and A are B and r; they task y I need to do all thinks to figure out how as guilty and who is not guilty an all we mate say that, I will assumed that, I will began with a is guilty and I will substitute into this information, I will find out what C and then from you can find out way what, AC all about then you can find out all other think.

So, you can do it that way of also, but we are trying to solve this problem in much more regress way semantic tableaux method is very simple to use. So, and very effectively kind of method it will list out all the possible under, which is formula is going to the

through it will not live out any possible. So, now, so, this is over. So, now, he will tick mark this 1. So, he will farther simplify this 1.

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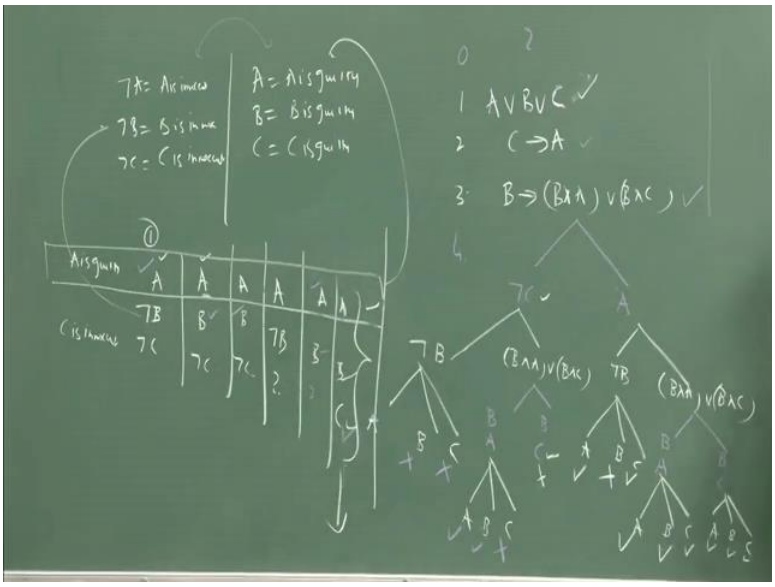

So, now, this comes B and A because B and A is written in this way and this is B and C. So, now, in the same way, list to the branch because of disconnective or this is BA and B and C. It will bit of effort is needed to see, what conditions and that is become through. So, what is left is, this particular kind of think. Now, here to see here you will observe that here, C here and not C here no; obviously, the branch closes now you're to find out whether any way in which, we can close the branch. So, this branch is opened and this is also open and all the branches are opened. So, now, what is left is this particular kind of think, now we will check this formulas each open branch that we have, we need to add this information.

So, it is A are B are C. So, this is a branch off course like this; now, this is also again and open branch. So, we write ABC now, this is a close branch we need have to have to wary in much about it. So, now, A not B and you ABC and this is also an a open branch. So, again you add this piece of information under this branch, ABC, again you add the some information here. So, there is a we orating all the rules of all the bit etcetera in all. We ended off with only atomic change, atomic preposition there are no rules we can be apply

on this 1; that means, they can screen. Now, we need to observe weather that is any completing information in any 1 of in these branches. So, now, here A not B not C. So, this is our branch is open now, we have B here and not B here this closes and C here and all the way up here.

So, we have not C here, C and not C is competing information that close. So, now, A B and C this branch is opened. Now, this BCA this branch is also opened now we have C here and not C this branch is closes. The branch means, the part of the tree is like this not C on the way down here and all the way like this and then it is going all the way down here. So, now, here next branch is also open; now, we have B and not be here is close this and this remains open. And all the open branches are the 1 which he need to taking in to consideration first solving this particular kind of problem. So, now, this branch is also this is also open, this is also open, and the other entire branches are open.

So, now, what is that trying to figure out, we are trying to figure out whether are not is guilty, he is innocent? He is guilty means, we need to he need this formula A; A his innocent means, we need to get this particular kind of think. So, now, we need to observe all open branches they which satisfies this particular kind of formula. So, now, so, in this open branch, we have 1 particular kind of solution is A not B. This is the 1 which need to not C. What does it mean, A is guilty, B is innocent and C is innocent. Now, this A is guilty. So, that is the first on which we dot, the open branch here, now other open branch is AB and C and not C, AB and not C so; that means, again a is consider to be guilty here .

So, that is 1 way of going at another possibility is this 1 this open branch BA and not C the same think which we have. So, AB and not C and B and not C B A and not C; this is the 1 formula. Another 1 is A not B A and not B. We do not know about C is in this particular kind of information. So, now, the other possibility is A B same think which we have now, other possibilities A B and C A B and C. So, now, the other open branch is this think A B C. The same think, which we are return, in the same way we have A B and C here.

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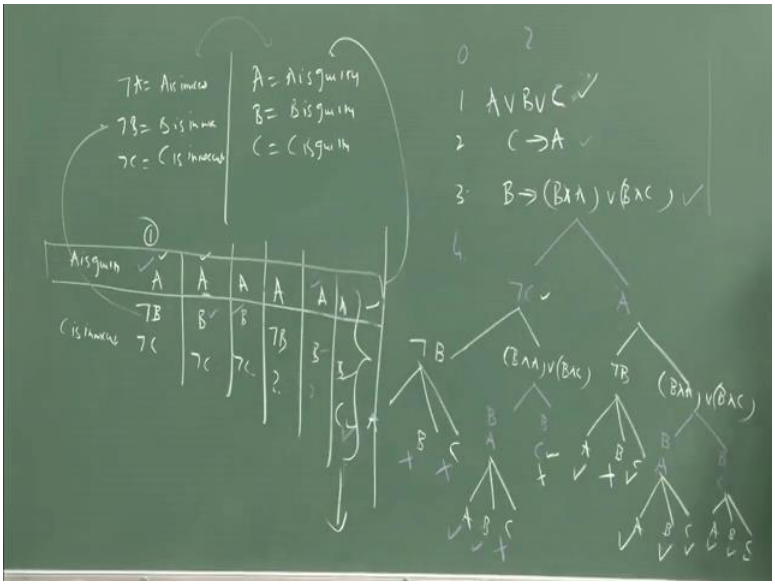

So, this same information, which we have even here, also ABC in all the possibility here, we have only 1 particular bit of information, which clearly indicate that A is consider to B guilty, but your ask to find out whether B is guilty, as B is guilty, the problem comes very difficult to determine in some cases B is is consider to b innocent, C is consider to innocent here, but now in this case, B is consider to guilty and not C is consider to B, C is consider to be innocent here, in the same in this to in this information is 1 of the same. Now, in this case we cannot remain any think, in the case of A is defiantly guilty here, but B, we can say that is again guilty, but C is correct determine in any think.

So, this problem alt list, no with this particular kind of formula we can achieve this particular kind of think that, in all the cases that we of study all open branches, a suggesting as that it is only A is guilty, but the problem is that, under central we have some more information we will not position to determine whether B and C are guilty. So, we need to add some information to this 1. So, that detective as find out, what information 1 is to add. So, that even he come across with some kind of avoidance that B and C also going to weather we are innocent are guilty and for that, any some more bit of more information. So, solve the particular kind of, but as per as A is concern, we are trying to find out, that is the reason we ask in the question whether A is guilty, A is innocent in all the open branches it clearly suggest as that, it is point into finger towards

A; that means, A as to be guilty.

So, whenever A come across information A; that means, the virginal translation is like A is guilty, whenever you have this information and not B then; that means, so, this is the think, B as to be innocent, but in some cases B is innocent, some cases it is not we do not know what it is. So, that is a reason why we cannot specifically tell about whether or not B is involved, B is guilty are not. So, know this also satisfies; so, the other condition that whenever C is there A is also accompanied with that particular kind of think. So, were aver C is this there, then that as to satisfy in this particular kind of think. Weaver A is this C, as also to be there, when A is guilty, C as also as to be guilty; that means, with that particular kind of information we can even talk about, weather and not B is guilty or not.

This particular kind of solution we taken to consideration, were we have all ABC an all. Let means all, ABC are set to be guilty. So, in that were, we can solve this, robbery is case an all. So, here in this problem, we can clearly say that A is consider to b guilty. So, there are some other problems so, which we can solve. So, we looking in to some other issues; related to this semantic tableaux method. So, what is importantly here is, this that given a problem we need to translate it in appropriately in to the language of preposition the logic.

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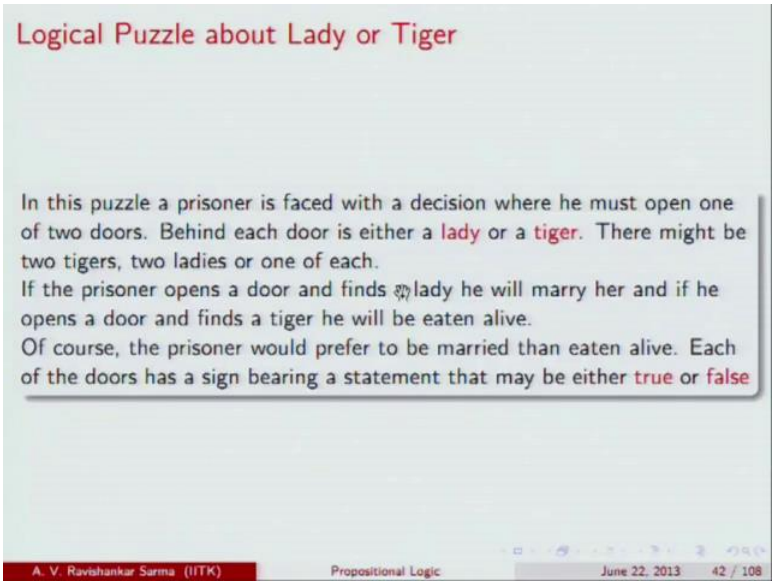

Once you translate into the prepositional logic thinks will become simple. So, we are trying to looking to some other kind of problem. What we will do is we translate the English language sentence in to the appropriate language of preposition logic And then we will See whether that argument follows are not.

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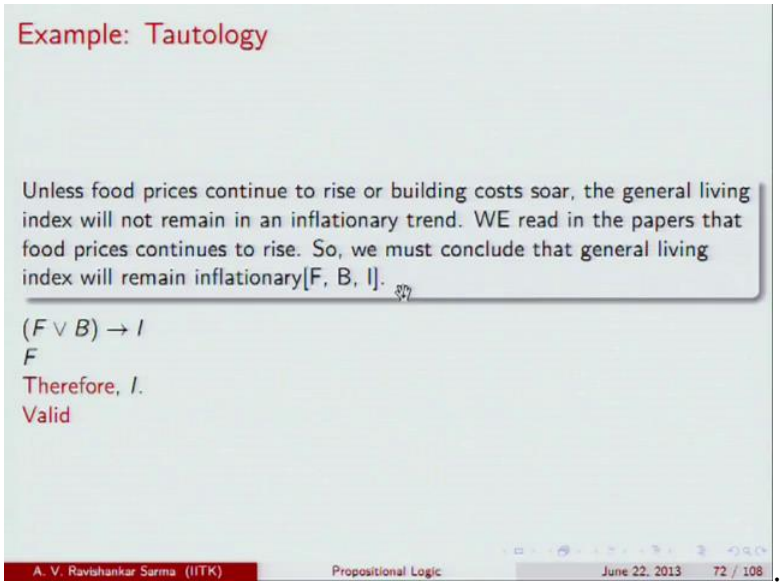

So, he raise simple example, which is there in natural language that is in English. So, it says like this, unless food prices continue to rise or building costs soar, the general living index will not remain in an inflationary trend. So, that is the first sentence, from the second sentence he is read in the papers that food prices continues to rise inflation is rising food, prices vegetable prices are increasing. So, the conclusion is this that so, we must conclude that, general living index will remain inflationary. So, now, once your given this particular kind of for problem, the first think we need to do is you represent this sentences in terms of some kind of sententious later here. F stand for food prices continues to rise and B stands for building costs. So, over and see i stands for the general living index will not remain in an inflationary trend.

So, know the first sentence is Fare B implies I and second sentence is F therefore, now we need to see whether, this particular kind of conclusion follows some the premiers are not the premiers are, the first 1 is unless the food prices continues to rise the building or building cost. So, that is 1 premise and the second premise is the general living index will remain inflationary trend that is second premises.

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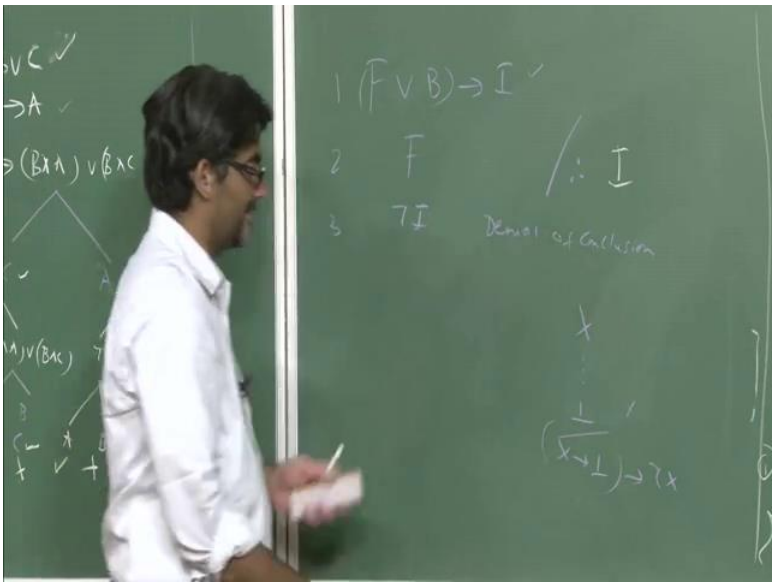

So, now, once we translated to this particular kind of think we have FR B implies, I this is the first 1 and the second 1 is the F and then, the conclusion theory is this 1I. So, now,

how do you know that, this conclusion follows from this 2 premises in all he rise the decision method which we have discoursing.

So, we are trying to solve this puzzle, this problem with the help of semantic tableaux method. So, now, in semantic tableaux method, the essence of the semantic tableaux method as we have discussed in grater it, A this that we need to consistence in a countering example. So, now, what we do here his see, we list out all the premise in all now we need to write like this. So, what will do is we negate the conclusion, his state with negation of the conclusion that is denial of conclusion. So, the idea here is is that we began with is some assumption x and you ended off with contradiction; that means, x implies contradiction and that implies that it should be no x rather than x. So, this is what is in other version of reduction and kind of method.

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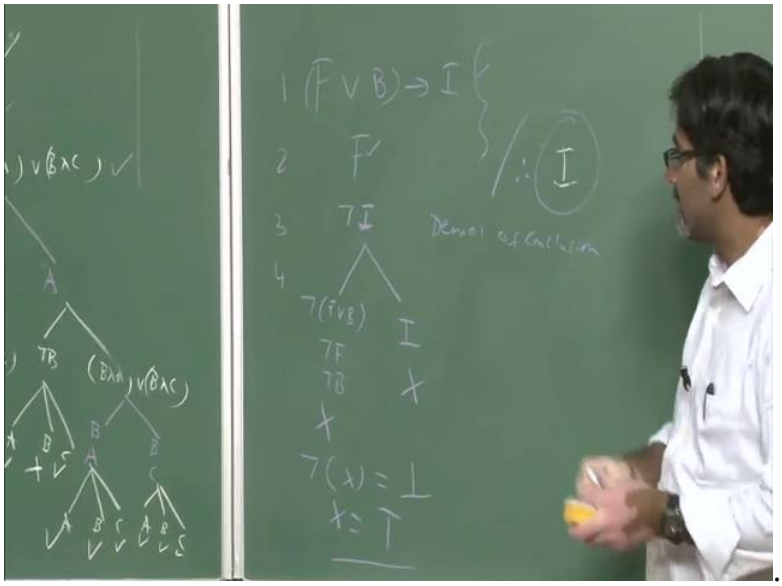

Now, negation of the conclusion we constant a tree for this particular kind of tree. So, now, the fourth –one is now these are 2 autonomic sentences on all his nothing no nothing needs to be done here. I mean no rule will apply in this particular kind of think. So, now, the only the rules of apply on this particular kind of thinks first formula. So, now, this is branch that is not of x and y is here I. So, now, this farther simplifies to is not F for B means, it is negation of a negation of distinction is consumption that is we list it

out just bellow this 1 and this is the 1.

So, now, their ends the tree. So, now, we need to see whether there is any completing information any 1 of the branches here, we are F here and we are not F here, this branch closes and you have not I here and I here is branch close so; that means, negation of the conclusion, that is what we assume then all the being leads to the branch closes; that means, it is a contradiction. That means negation of x, is unsatisfyable the other way saying that, same think is his that negation of x is unsatisfyable.

So, now, x has to be through n of it assure, such that x and to be the conclusion in of that mean x is what here, this is the 1. Actual an not x is, this 1 not of I, but the actual conclusion is x; that means, I, I is consider to be the conclusion of this 1. So, we will take the denial of the conclusion it leads to branch close it make transfer to satisfy so; that means, this particular kind of this conclusion follows from this 2 premises in all. So, this is the way which we can establish that, a given formula is consider to be valid are not; is consider this argument is consider to be valid are not we can establish.

So, what we of done here we are translated the English language sentence it is the appropriate the language of preposition logic. And just we simply forget about, what the mean then all, now then we apply semantic tableaux rules and with which we can find out whether are not the particular kind of conclusion follows are not.

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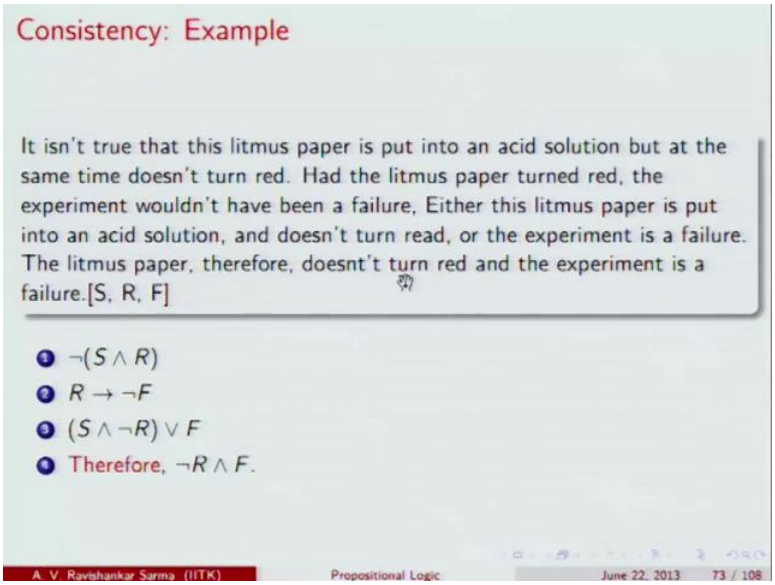

There other kind of examples, this class is all about solving some problems the best way of leaning logic case to solve the problems. So, now, he is another kind of problem, again it is return in the form of English language sentence. Now, we need to find out there are 3 are 4 sentence which are given. Now, we need to find out whether they are consistence to each other, again using the same method that is the semantic tableaux method. So, now, the first 1 is translated in this way, it is true that this litmus paper is put into an acid solution, put at the same time does not turn red you turn put in the litmus paper is put into the acid will become red.

So, it is not the case at you is put into s and then it is not R and it is translated into not of S and R so; that means S and R as to be case of all you. So, not of S and R is the first sentence. So, now, the second statement is had re first paper turn read, the experiment wouldn't by the is a failure the means, wouldn't have been failure is not if so; that means, are implies not F; is the second sentence. Now, the third sentence is A litmus paper in put in to an acid solution are he does not turn red it should be a red are the experiment is failure that is a S not are R F.

So, now, the conclusion is this thinks therefore, he does not turn red and the experiment is a failure. So, they are 3 thinks, which we can talk about consistence, but taking out all the 4 sentence is in all or since it is expresitly given that the last sentence is comes to be a conclusion. Now again, we can see with a help of semantic tableaux method, weather this particular kind of conclusion follows are not. The first think we which in a need to do is he to represent to this sentence this is in term in some kind of variable S R F usually we can return in the capital letters. So, now, once we know transform the this sentence in to the language of proposition logic and thinks came become essay.

So, now, he raises 1 we which, solve this particular kind of problem. So, we that some kind write met know without using this semantic tableaux method that this kind of conclusion follows an all, but they should be a procedure, for knowing that, this is the only follows no for given a information. So, the first 1 his not of S an R; we are translated it properly and that is the 1.

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The second 1 is R implies not F and the third 1 is S and not R S and not r F. So, now, the conclusion needs to be separated and this is the conclusion not R not R an F. So, now, again, how to solve this particular kind of problem is simply this think. First we take the negation of the conclusion not R F. This is denial of the conclusion, if the denial the

conclusion weather are not it leads to branch closer are not is a 1 which trying to look in to. So, what we done here, once you translate the English language sentence is into prepared language of preposition logic. We do not bother about, what we mean by S R etcetera in all, but we just use the method here and then once we get branch closer an all we will look back and then, again will looking in to how were translation part.

So, now, the 1 of the important methods, we seen is this that first. We need to apply in non branching rules over the branching rules, but here, it does not to be any non branching kind of rule here. So, that is why we can use any rule here. We can open of any statement. So, first we will start with particular kind of think not R. So, this is the first 1 which have use, we applied x in pulse y that is not not x R y. This is as it is then becomes negation. So, that is the definition of metrical implication know this is the over. So, now, we close particular kind of think.

So, now, we can open any 1 of this is does not matter, but some time prove by become simpler. If it take in to consideration some formula over the other 1 ’s, but moral is, if you have not branching rule we have use it first, we do not have the think it does not make difference. So, now, this is not are R and then negation of the disjunction is a conjunction. So, now, this becomes this; now, all is information we need to provide in the open branch. So, each stage he need to see whether a literal in the negation is there in the branch.

So, now, this R and not R closes and this branch is still open all this branch are open. So, now, this formula is also over; now, we are left with to other formulas an all. So, now, we will open up this 1. So, now, this is not S and not R. So, not S and not again the same information you will write it here also, not S and not R. So, now, again you will see whether any completing information in the branch are not. So, here is a branch we have R and not, R we need to close.

So, not a final this remains. So, now, this is also over now, whatever we have left is. So, now, this is not of S and not R. So, this is simply it is a S and not R or same. The same information we need to provide and not R and F S and not R is to write it properly. So, that S and not R and x and we will another open branch S and not R F1, is to be a very

clear about this think negation. Suppose, if you some was skip this negation then you will branch well not close or my be branch close for a wrong reason.

So, we need to take case of these symbols. So, again this is written to be little bit peasant in doing well solving the problem the problem which will become simpler for us. So, now, it is S N not R and F. So, now, there same matter is 3 and an all. So, now, we need to see, weather and not all the branches are closing are not. So, this is S and not R. So, now, we have S we are S and not S here, this branch is closes C R and your F here and your R F here, this branch is closes this and now, we are S here S here not R and not F not R. So, this branch is open.

So, now, all other branch are open; now, we can start here itself we need about very much about all the other branch is now. Why because, negation of the conclusion leads to some kind of counter example, this severs as a counter example of 1 open branch his good inapt show that his argument as it follows. So, even in a we do not have a inspect all the other open branches in al. Just 1 breach open branch will serve over purpose. So, what we achieved here purpose. So, what we achieved here we listed out all translation of a given English language, sentence in to the language we proposition logic. We forgot about what a mean by areas Q etcetera an all.

We listed out the conclusion of separately and then we negated the conclusion and then we are trying to see weather, at list to the branch closer are not, there means all branch are should closer. in the process we came with at list 1 branch were it is open; that means, when a give valuation T S is T R is F and F is formula, F false then; obviously, if satisfy is particular kind of formula. What satisfy is think, it satisfy to primes an a false conclusion; that means, that makes it formula, this argument invalid so; that means, you come a within a incident very out your primes are true in a conclusion in a false.

So, that will sever our purpose; that means, this particular kind of argument that is the litmus paper; that means, therefore, it does not turn red and the experiment is a failure that is not R and F does not follow from this 3 thinks, then information that we have. This is the way, in which we can solve this kind of puzzle and we will looking to save more problems.

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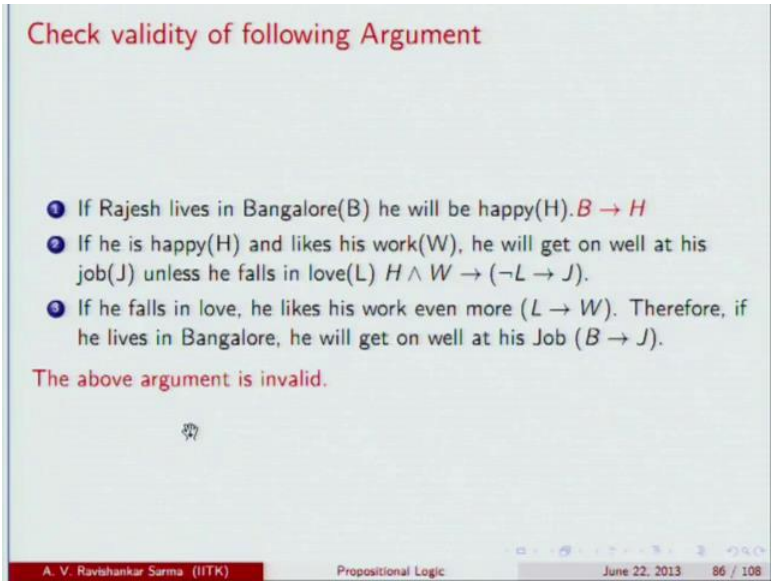

So, let us considered weather are not, this particular kind of argument is valid are not. If Rajesh lives in Bangalore, he will be happy, Bangalore is a good city it offers many thinks smalls etcetera and all. So, probably may be happy and this case this no question probably he is happy; that is the 1, which he need to take in the consideration we implies h is the think. So, now, the second statement is if a happing any likes is work that is H and W implies, he will get on well in is job, unless he falls in love with someone else. So, same as he not fall in love with same 1 else, we will do well and he will work well fain etcetera an all.

So, this unless always presents some kind of problem are this unless falls in love is transected as not in implies; that means, l not l is the case then; obviously, it is J. So, if then kind of think some time unless is translated in terms of. So, R designation etcetera some time it is translated in another implication, does way present some kind of problem to us; in the process of translation. So, now, we this is second sentence is translated an H and W implies not implies J. Now, third sentence we first 2 if we falls in love, that is L he like his work even more it is no happen that we falls in love and then; obviously, met start working in a more effective way L implies W.

So, now, this is the competition. So, if lives in Bangalore he will get an well, in is job.

So, now, weather and not this particular kind of argument is valid are invalid. Again we can use either truth able methods are semantic tableaux method etcetera. And all will to show that his particular kind of argument is valid are not. Now, first you list out all this thinks B implies H, that is the first premise that is a return in English language and the second 1 his H and W.

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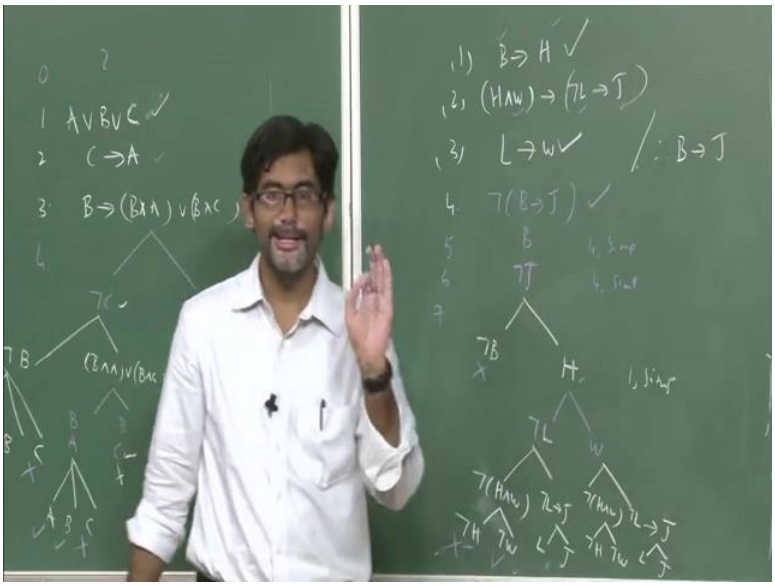

If a lives happy and in works and under sentily falls in love with someone, you will continue to job do is job effectively. So, now, third 1 is particular kind of think L implies W. And this gets separated by confusion; the conclusion is if a lives in Bangalore then, he will do, he will get on well with this job. So, this is the 1, which he have once with translated the English language sentence his becomes like this. So, now, again, 1 way of solving this problem is that, list out all the premise is and he contrasted truth table and your truth able will have for example, 1 2 3 4 5. There are 5 prepositional variables an or so; that mean, they will be 2 to power of 5 entries in your truth able.

So, now, we are inspect all those rows have been all a 32 rows and we need to see in at looks for in a row in a which here weather and not we have through premise and falls conclusion. So, intrude of impacting all this thinks. So, he will better solve this problem using this using semantic tableaux method. So, now, you start with negation of the

conclusion, of this becomes like this as then we start contracting a trick. So, as usual we will be using the non branching role first at means this is leading to non branching roles. So, that is we applying non branching rule first 4 are 4 we can use half rule beta rule. So, this is not J. So, know we can open any 1 of this check this formula, you put a tick mark to this 1 and start opening in the formulas. So, now, we will open this L no B and H.

So, we can write it in this case 1 simplification you will get this 1. So, now, this is over you tick mark this 1, other vise he will start using a again and again, then way confession. So, now you open up, this particular think; now here, B and not B is branch closes here each time your play in half and beta rule we need to see weather, the branch is closing are not. So, now, this branch is open now, we need to expand it with other thinks which we a unchecked. This all are unchecked formulas is to. So, now, we apply this unchecked formula, this 1 and the many of apply this rule half rule to this 1 is become this 1 not L are W.

So, that is definition this is become like this now, so, this is over now, whatever it is unchecked is this 1. Now, we need to see whether it is branch is closing on not here does no way in which closing. So, now, to expand it with is this is H and W not of H and W and same think not of L implies J. The some information you write it here not of H and W and not of L in to J the same information he put into all the open branches; that means, this becomes this. So, now, you further simplify this 1 it becomes not H and not W and this becomes L and J and this becomes not H L not W and again this becomes L and J.

So, the bored as ended with this thinks now, we need to there is now further half and beta rules can be used becomes all this thinks are atomic statements a prepositions. So, now, he to inspect in each and every 1 branch weather this any completing information are not. So, now, we have not H here and your H here is branch clearly close the see R. So, now, we are not W and all. The write down. So, this branch is open. So, very again for the validity at list 1 branch is open, we can start of here itself so; that means, a he need to how very much about, all the other open branches in all 1 open branch is clearly establishing else that, this is invalid kind of argument.

So, what is it we are see in this lecture, he simply this that we began with the semantic tableaux method and we started up applying to a solving some of the logical puzzles; mainly knight and knaves puzzles and then we moved on to some other interesting puzzle some interesting problem that accrues in day to day discourse; that means, a given in English language, passage translated in to the language of appropriate language of preposition logic and then we are seen weather are not the conclusion follows from the premise are not.

So, this particular kind of semantic tableaux method can be use for solving. The puzzles in particular the knight and knaves puzzles are 1 need 1 want to find out mistress surrounding a robbery are theft etcetera. That is what, we are seen in this class are it can be even be it will serve as 1 of the important in effective decision procedure method and with which we can find out, weather and not particular person is committed guilty, are innocent all this in which he we come to know with the help of this particular kind of technique. So, for we of covered semantic tableaux method. So, the next class he will be seen, another kind of synthetic method which is called as natural detection method. So, he will talk about the natural detection method in the next class.

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