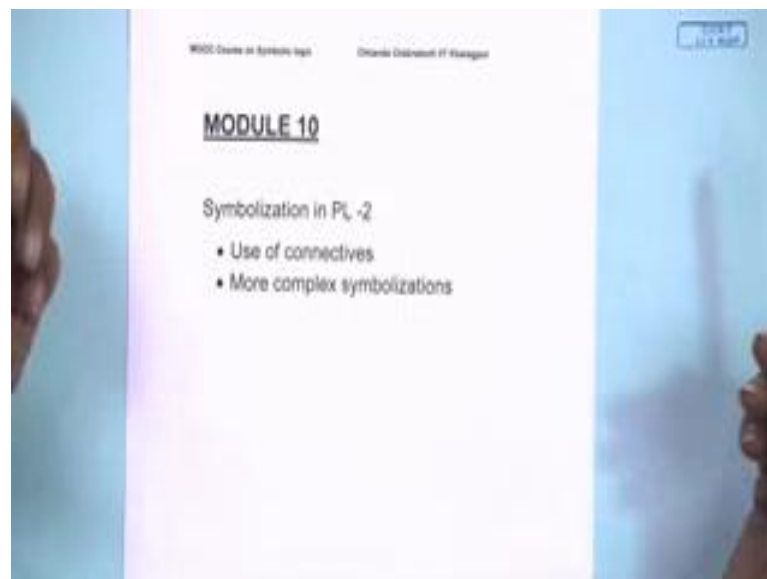


Symbolic Logic
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Lecture No - 10
Symbolization with connectives

Hello and welcome to this module 10 of the NOC course on symbolic logic. We just have finished understanding symbolization how it is done in the previous module and I asked you to sort of give yourself little bit of practice and careful reading and patient analysis and so on. So if you have done that, then you have grasped how symbolization works in PL. If not we will try to adverse that, but together today, what our plan is to move forward with symbolization a little bit. We just started in a very sort of elementary way. Today you might see some more complex symbolization.

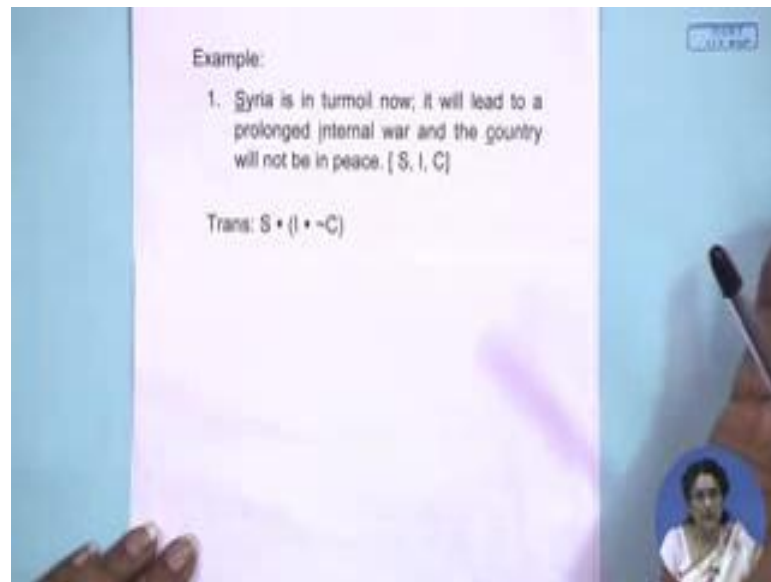
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So today's agenda is to see the use of connectives in other contexts, in various contexts and then also to understand more complex symbolization. When I say complex symbolization, I mean that you do not have those 5 standard connectives, but there are this words and these are logical words that are thrown at you and you are supposed to decide for them, with the use of 5 connectives. So we are going to see some of those

situations with English examples and then we do the translation together. So, that is going to be our agenda today.

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Let us start by doing some symbolization together. Here is a sentence, Syria is in turmoil now. It will lead to a prolonged internal war and the country will not be in peace right. So here you are that given S.I.C, S stands for Syria is in turmoil now, I is for it will lead to a prolonged internal war and C stands for the country will not be in peace.

Now, this one we see the reason I have chosen this one, is that there is a something little unusual about the first preposition, in what sense that, we find that this sentence ends with a semi colon and then the second preposition starts. So in a way this semi colon is a connective that, we need to interpret using all 5 basic connectives. What will be the proper connective to use here that is first question and then the remaining one is there.

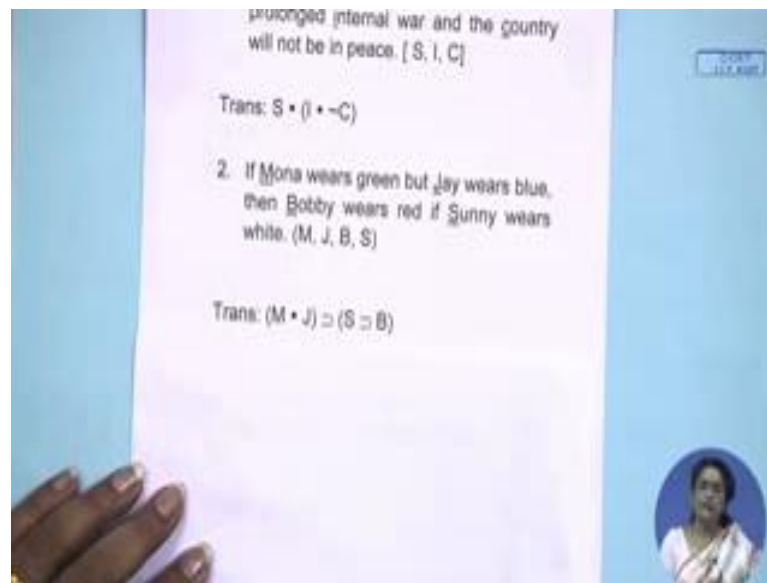
Second point is that, if you think this semi colon is one of those 5 connectives. Which one you think is the closest approximation to? Is it not, is it and, is it either or, is it if then or, is it if and only. Now if you read the sentence you will say this has to be closest one that is going to be is and or conjunction, because anything else does not fit into the scheme of the way we can understand the preposition.

So if it is conjunction, then here is also an and see this semi colon is an and, and then there is an and. In that case again the question comes about the grouping. How am I group, if all of this there is this two dots, how do I group it and your answer lies from the reading of the preposition; how to group it, which one is going to be my main dot, the main connective. Read again and you will find that the sentence naturally pauses at a certain place, which is here. Syria is in turmoil now pause it will lead to prolonged internal war and the country will not be in peace. So this is going to be your main pause, main connective. this whole thing is going to be your other conjunct.

So, let us see if we have picked up these new answers from the preposition, then how to translate this. So as I said, there is this dot instead of the semi colon, this and is very clearly the dot here, why this dot is the main and this dot sub I have tried to give that answer also, that there is a natural pause in the way that the sentence is constructed. So this whole thing becomes another conjunction.

Some of you will say, but why are you using not C, tilde C, is not C the whole thing the country will not be in peace. I have given the answer earlier also, the usual way to read this key is that when you have C it stands for the simple preposition, what is the simple preposition the country will be in peace. The country will not be in peace or it is not the case the country will be in peace that is a compound preposition which is why C stands for the simple. The country will be in peace therefore the translation is not C alright. Has that help. So slowly go slow in the beginning, but this is how to pick up on your translation skills.

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Let us try another one, if Mona wears green, but Jay wears blue, then Bobby wears red, if sunny wears white right and these are colorful people. So here you are and these are obvious choices M, J, B, S standing for names. Now what is happening and what is the main connective. There are so many connectives here, here is but, here is if, here is then there is if and so on, but what is the main connective here which one ranges over the whole sentence how to read that and then again we start at the beginning and we go here, here is a comma and then comes the then right. So this portion seems to be an antecedent and this portion seems to be the consequent. So this if and this then is your main connective. So this is a conditional statement or a cautious statement. So if this happens then this happens alright. So that is our first thing that we have figured it out.

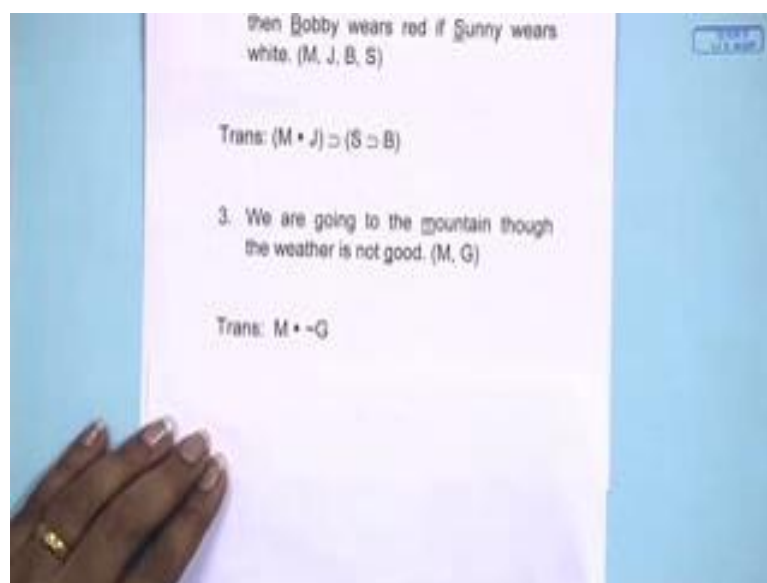
What will happen in the antecedent, we find that there is but, by now we know that but is the closest one, that we can replace it with these of the conjunction or the dot alright that is easy.

So we are talking about M dot J fine. Then what is happening in the consequent, Bobby wears red, if sunny wears white. So we find that there is if then sentence even here, but what is the antecedent, I said what follows the 'if' is the antecedent. Therefore in this case sunny wears white is the antecedent, Bobby wears red is the consequence. So if you have

grasped that then the translation is going to be easy to do and we are going to require some bracketing also. So, let us check what we can do.

We said if then is the main connective. So here is the main connective and I said the antecedent is like Mona wears green 'and' 'or' 'but', Jay wears blue fine and then here comes the other if then sentence which is your consequence, which I said whatever follows the if is the antecedent. So Sunny wears white is your antecedent, Bobby wears red is your consequence right and no need to have a separate (Refer Time: 08:55) around this. Because remember the horseshoe is a binary connective. So its range goes from here up to here. This is its antecedent; this is its consequence right. So, that is your translation of the second sentence.

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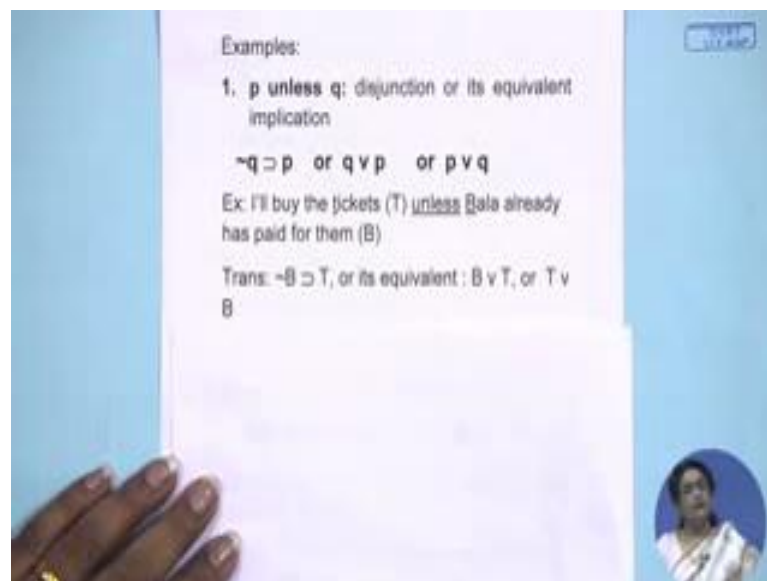


Here is another one. We are going to the mountain though the weather is not good. There are two sentences so M and G and by now you should know what its for about. So we are going to the mountain is your M and weather is good is G alright. So weather is not good is not G, G stands for weather is good. Main thing to find out in this case is how to read the thought, what is the closest connective to though. Again is it not, is it either or, is it and, is it if then, or is it the if and only, and again a little bit bran brain racking will tell you that this is going to be again a conjunction a dot. This though this and that is a

conjunction sense. Sense of conjunction; if you know this, now this is going to be your main connective and we are going to just connect these two sentences. The translation is going to be very easy this is simple $M \dot{\neg} G$. For reasons that I have explained with, so I leave it in front of you, these are just beginning of your translation skills and slowly we are going to you need to practice a little bit. So take sentences of your choice and try to plug this new found knowledge of connectives into it, to see how the translation in PL is going to be done.

What I have just shown you are rather still more or less under at the elementary level though we have tried to understand them with some finish, but now let me take some connectives which are not at all they do not even pretend to be simple say for example, take a look.

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Suppose we talk about unless p unless q , what am I say p happens unless q happens. So when q does not happens p holds, this one way to read it. You will say but you can also read it as that if q happens p is not going to happen true. That is also is the case, but you are beginner. So p unless q you can safely say that if q does not happen p is going to hold, p is holding is default unless q right.

So let us take a look, the way to translate it will be through some sort of if then or its equivalent disjunction. As we progress we will see how the implication in disjunction, implication means horseshoe and disjunction means the either or, or the well. How they are equivalent. We will try to learn that as we go along, but right now take my word and this is how to translate p unless q. So q do not does not happen p holds or equivalent of this is going to be $q \vee p$ or $p \vee q$ alright.

So look at the way this is translated, p unless q is your rather strange kind of a connective, but this is how it works. If that did not help you to understand this let we take you an actual preposition. I will buy the tickets unless Bala already has paid for them. This is your t this is your b I will do this, but holds unless this happens. So if this does not happen this is going to hold, that is the one way to read that. So translation wise you might go like this, if not B then T or what is its equivalent $B \vee T$ or $T \vee B$. This is how to translate unless.

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The slide contains the following text:

$\neg q \supset p$ or $q \vee p$ or $p \vee q$

Ex: I'll buy the tickets (T) unless Bala already has paid for them (B)

Trans: $\neg B \supset T$, or its equivalent: $B \vee T$, or $T \vee B$

2. Not both: Denying their conjunction

Not both p and q: $\neg (p \cdot q)$

Ex: Not both Bina and Azad will be in the team. (R, A)

Trans: $\neg (R \cdot A)$, or its equivalent $\neg R \vee \neg A$

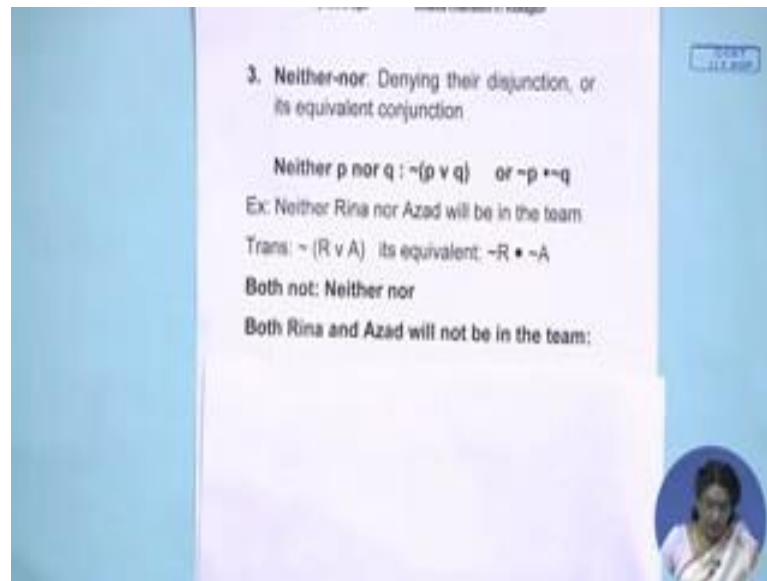
There are more sequence connectives like this which is rather strange for example, not both. When you say both A and B, obviously that is a conjunction, but what is that you are saying, when you are saying not both. What you are doing remember you are denying the conjunction. You are saying it is not the case that both. How do we represent that

with the symbols? So where p and q are any given two propositions, not both p and q you are saying, it is not the case that both p and q are true.

You are denying their conjunction not individually, not both; both of them will not be done, not both for example, and not both - Rina and Azad will be in the team. One of them might get in, but not both. So the correct way to approach this is to understand it as it is not the case, that both of them will be in the team. You are beginner so I suggest that you try to get this here as not both, its equivalent is of course, this either it will not be Rina or it will not be Azad that is sure.

But may be at the beginning get used to looking at not both as a it is not the case that both and that should help you in your translation. So this was sort of a different kind of thing and here comes our other one, equally confusing sometimes students get confused over this neither nor. Earlier we have seen the not both, here we are saying neither this, nor this, neither p , nor q . Why do you say that? What is that you are doing? What you are doing is that you are denying their disjunction. This is very different from saying not both; this is where you are individually rejecting each of them. So you are denying their disjunction or equivalent whatever comes out. Many of you have done through the C, N, F, T, N, F. So you may have some idea about the equivalents, but we will come there when the time comes.

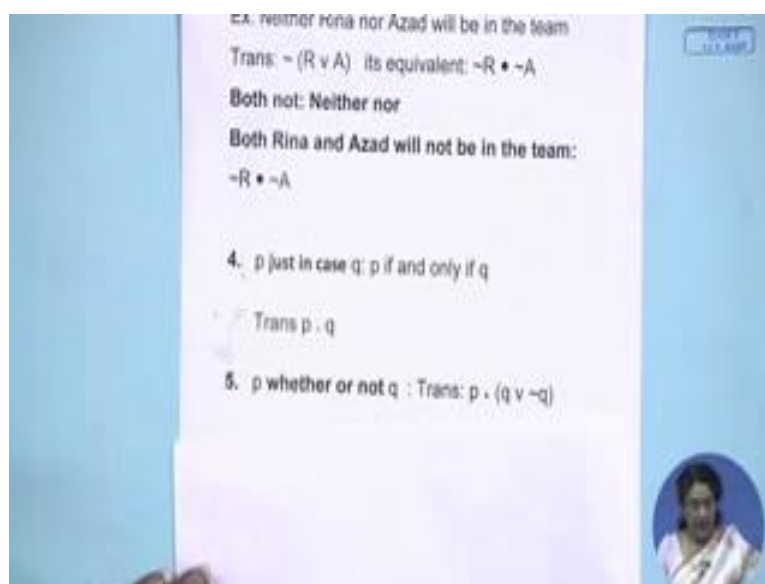
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So let us take this. I am saying neither p nor q. What I am telling is not the case either p or q. It is not the case either p or q or its equivalent, p is not going to be the case and q is not going to be the case, whichever suits you to understand this, but neither nor is not treated like not both. That is my first request for you to consider. I will plug the same sentence for you to understand this. This is neither Rina nor Azad will be in the team, we are not saying not both. We are saying she is not going to be in the team, he is also not going to be in the team. So you can go like this or you can say it is not the case either Rina or Azad is going to be in the team does that help.

Let us take a closer one also when you say both not, both of them will not be in the team. Not both is one way to go, this is both. Both not remember is the same as saying neither nor both. So both Rina and Azad will not be in the team, you can go you can treat it as a neither nor preposition statement.

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There are many other connectives, that you can also encounter and try to translate I am not going to mention all of them, but just few so that you have some idea that how the translation might work, that just because we have five connect it does not limit us to what. Say for example, you have p just in case q, just in case is not any of the connectives that we have exposed so far, but just in case stands for both necessary and sufficient condition. So in a way just in case is the other name for if and only alright. This I am not saying that you are supposed to know this, but the readings are - sarge and the logical analysis will tell you why this has to be the case.

As a beginner note that just in case is nothing but a triple bar in your connective, so translation of this is going to be p triple bar q, this is rather interesting one p whether or not q, p happens or p holds whether q holds or does it. So one way to go about that is to say p happens and q or not q. So this is one way to capture what we are trying to say whether or not q.

Now these two the last two are left little bit advanced and I just thought about introducing you to this. So that you understand that translation is more interesting and it can be a quite complex, but this is how far at least we need to know and translation wise I always say that you know slow understanding and a little careful and rather what

should I say more patient treatment of the preposition will help you in getting the translation, but you need to understand the connectives, you need to understand what is the scope of the connective and you also need to understand the intended grouping in the preposition and that is how symbolization in PL will work. So this is how far I will go in this module and next module on wards we are going to start something else.

Thank you very much.