Engineering Mechanics
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Module - 02
Lecture - 02
Plane Trusses - II

In the previous lecture, we introduced trusses and solve an example using the method of joints.

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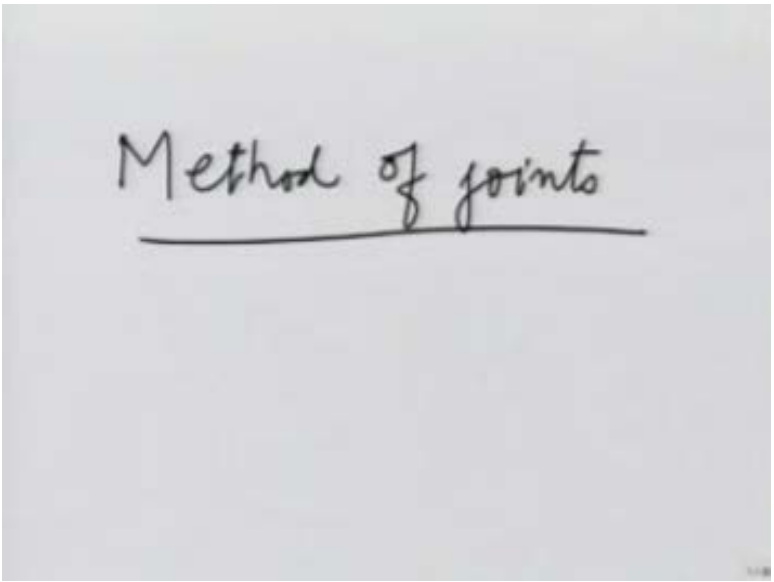

In this lecture we continue with the method of joints, and solve two more examples using this method.

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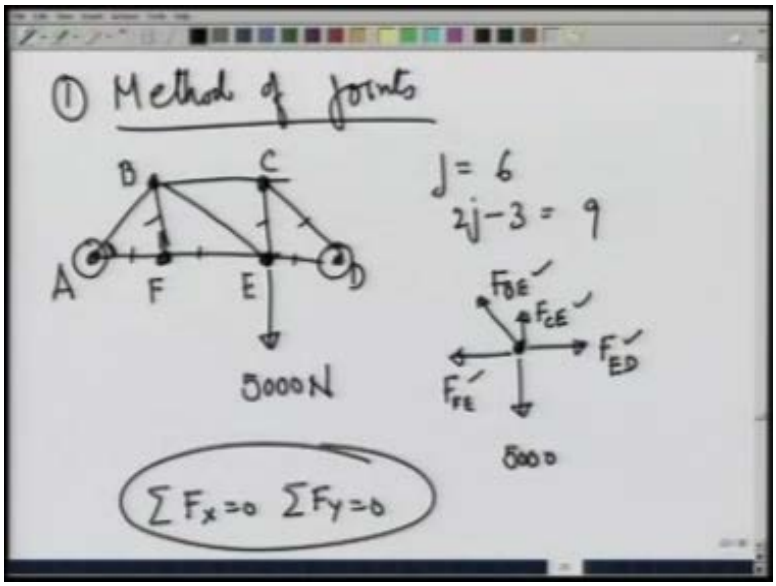

So, I will take a simple truss like this each angle being 45 degrees. These are the joints, you can see, there are 6 joints. So, j equals 6, 2 j minus 3 is 9, and there are 1 2 3 4 5 67 8 9 members. I am going name this A B C D E and F and apply a load of 5000 Newton at E. I want to calculate the force in each member of this truss. So, ideally if I start with this point, I would take point E.

The force on point E is 5000 Newton, and then a force due to member B E. Let me call it F B E, a force due to member F E D, a force due to member F C E, and a force due to member F E. Remember all the forces are acting at the same point. Therefore, torque equation is automatically satisfied the only equations. I have at my disposal are, F X equal to 0 and summation F Y equal to 0. Therefore, I have only 2 equations that I can apply at this point.

However, the number of unknowns is 123 and 4 and therefore, I cannot directly apply these 2 equals and get the answers by the way for that what I should go do is get to those points, where there are two unknowns only, and those points are A and B, A and D. So, first thing is to get the forces at A and D, and then go to other joints from there onwards. So, let us do that to get the forces at points A and D.

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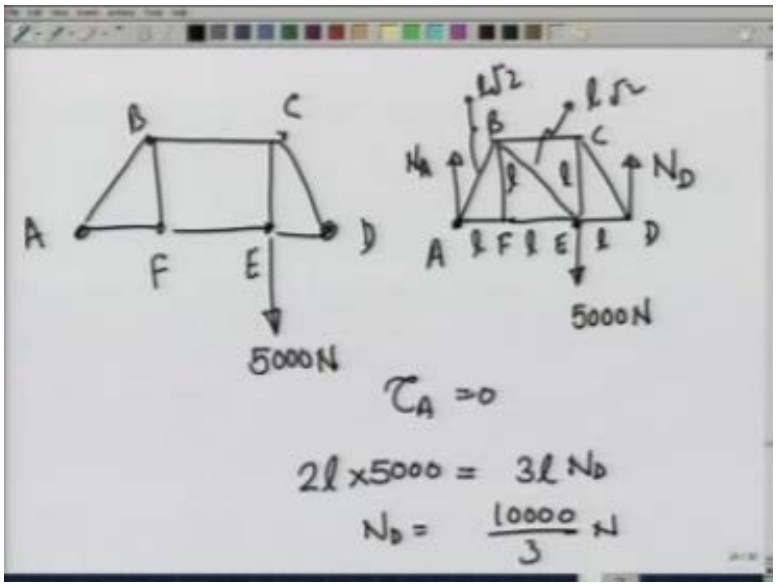

Let me make this again A B C D E, and F the force of 5000 Newton acting downwards. Let me take the entire truss as one unit, let the normal reaction at D be N D, let the normal reaction at A be N A. And there is a force acting downwards of 5000 Newton. I have not been careful in making this to scale. Let the length of this small state rods be l, so that this diagonal rods is l root 2, this length is also l root 2 and so on.

The first thing I want to do is get N A and N D. The simplest thing to do in this case would be to apply a torque equation A Bout this point A, when I apply the torque equation A Bout A and make it 0. I get 2 l times 5000 is equal to 3 l times N D and therefore, N D comes out to be 10000 over 3 Newton.

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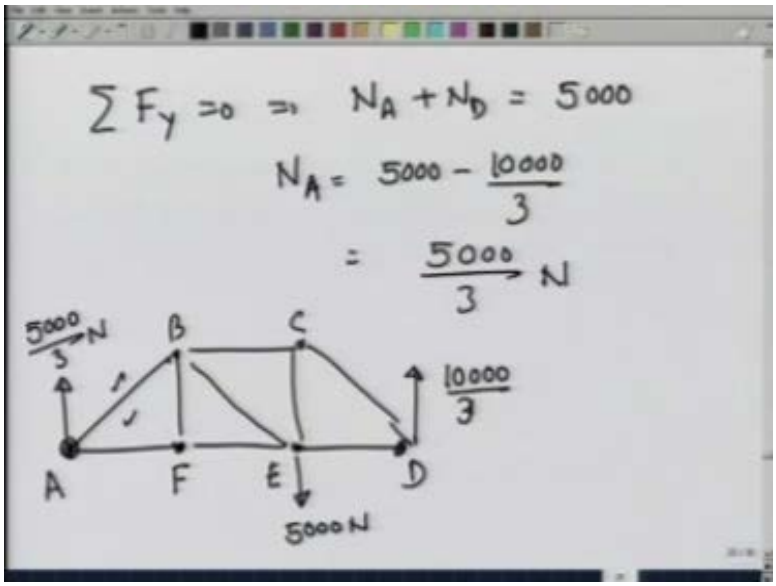

Once I know N D, then summation F Y is equal to 0, gives me N A plus N D is equal to 5000. And this gives me N A to be 5000 minus 10000 over 3, which gives me 5000 over 3 Newton. So, now if I look at this truss try to make it to scale. Now, I know there is a force acting here 10000 Newton over 3. There is a force acting here downwards 5000 Newton. There is a force acting upwards here 5000 over 3, and this is A B C D E and F.

Now, at point A there are 2 unknowns force due to A B member and force due to A F member and therefore, if I bring this pin in equilibrium. I have two equations summation F X equal to 0, and summation F Y equal to 0. I can solve for both the forces. So, let us do that at point A, so at point A, the pin at A is equilibrium.

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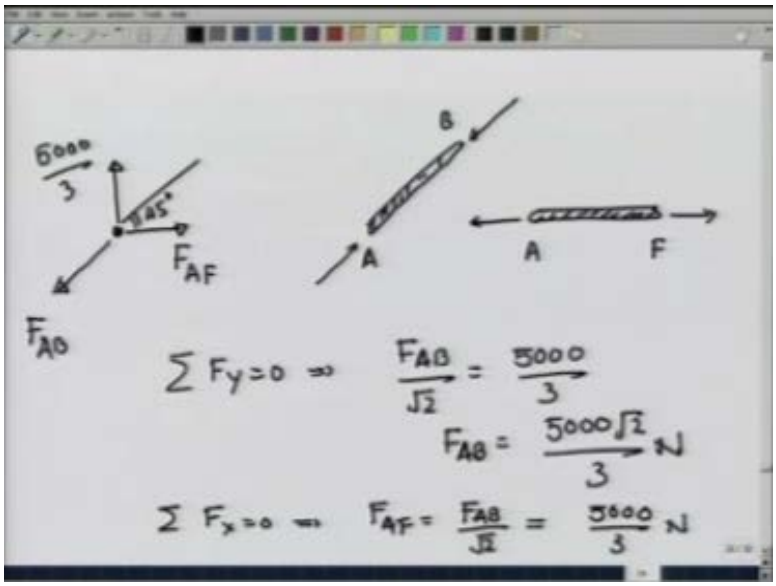

Under force, which is 5000 over 3 Newton acting upwards as well as this I need a force on this F A B acting in this direction, and to counter the X component of F A V. I need a force in this direction, which will be F A F. I have already anticipated the directions of these forces, obviously the force on member A B due to the pin. Therefore, with this direction, so this is the compressive force and force on FAF. This is A B, A F would be in this direction and this will be a tensile force. So, the member A B is under a compressive force, and member AF is under a tensile force.

Let us now calculate these forces this angle is given to be 45 degrees summation F Y, is equal to 0 gives me FA B over root 2 equals 5000 over 3 or F A B equals 5000 root 2 over 3 Newton. Similarly, summation F X equal to 0 gives me F A F to be F A B over root 2, which is equal to 5000 over 3 Newton. So, now I have go forces on 2 members of the truss namely A B and A F.

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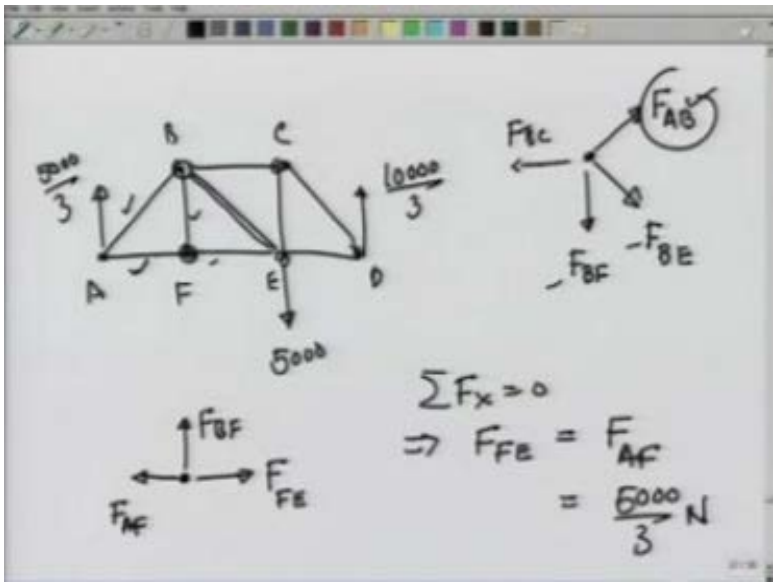

If, I make it again, I know the force here is 5000 over 3 force here is 10000, over 3 force here is 5000. I know the force in this member, and in this member. Now, if I go to point F A B C D E or point B. I have 2 all the 3, I have 1 force, which is known and therefore, I can calculate the other 2 forces. Let us go to point B, the pin at B is under equilibrium due to a force on A B, which is compressive.

So, it pushes the pin in this way there is a rod like this, and there is a force B F. Let us call it F B F. There is a force F B E and there is a force F B C. Sorry, I said earlier that at point B I can solve, but no I have 1known and 3 unknown equations are only 2. So, for point B I cannot solve, but certain point F I can solve because point F. There is 1 known force F A F and F A F. We had determined it to be a force, which is tensile and therefore, it pulls the point F in this or the pin at F in this direction.

There is a force F F E and there is a force F B F from summation F X equal to 0. We get that F F E is equal to F A F, which is equal to 5000 over 3 Newton. Let me just check whether this force was really tensile or not.

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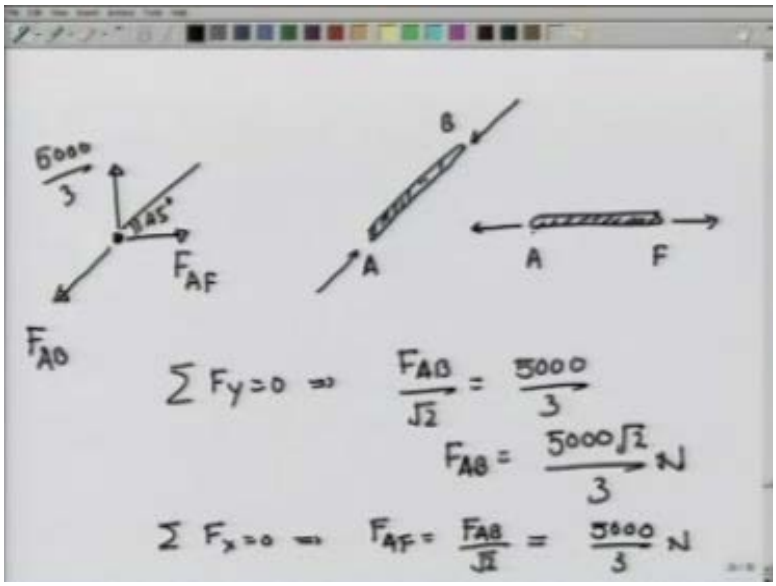

This was tensile. So, it pulls a pin N.

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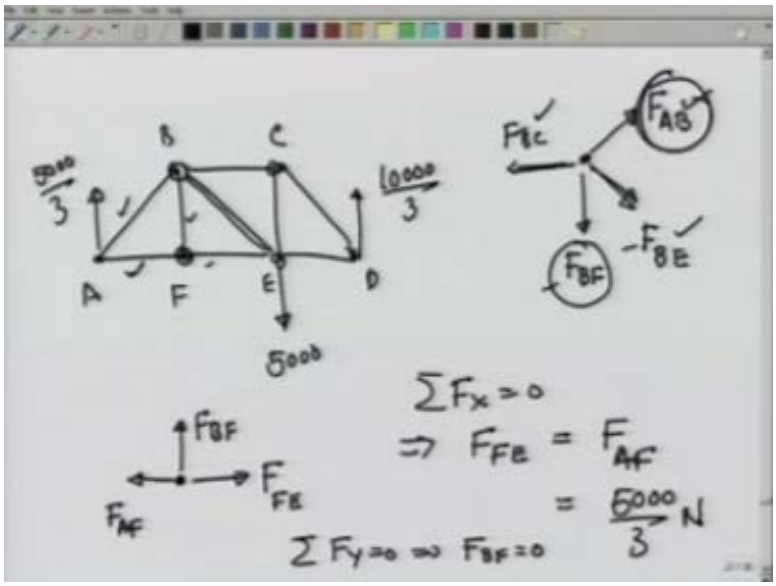

Now, summation F Y is equal to 0, gives you right away that F B F is equal to 0. The moment I know F B F, I know this force, and I know this force there are only 2 unknowns at point B. I can solve for forces F B E as well as F B C, let us do that. So, let us first write the forces that we have determined so far.

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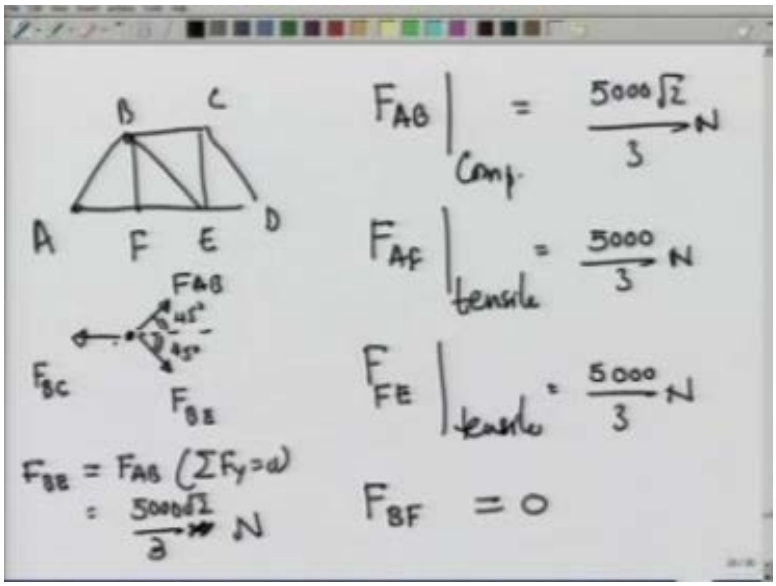

We have determined F A B and F A B was a compressive force compressive, and its magnitude was 5000 root 2 over 3 Newton. We have determined F A F, which is tensile, which is equal to 5000 over 3 Newton. We have determined F F E, which is also tensile and its magnitude is 5000 over 3 Newton. We have determined F B F to be 0. We are now rate and analyze point B.

Let us see, point B has a force pushing at this way because F A B is compressive and pushes the by Newton third law. The pin out there is no force in B F direction. There is a force F B E in this direction, and there is a force. Let us assume now to balance the forces F B C in this direction. These are at 45 degrees each right away. You see that, this is F A B that F B E must be equal to F A B this comes from summation F Y equal to 0 and therefore, F B E and the direction also comes out to be write should be equal to 5000 over 3 Newton.

The X component F B C balances the X component of F A B as well as F B E and therefore, I can write right away that F B C must be twice of the X component of F A B or F. This was F A B is 5000 times 2 root, 2 Newton, twice the, twice the X components of F A B or F B E. Let us do that now. So, at point B there is a force F A B working this way F B E working this way.

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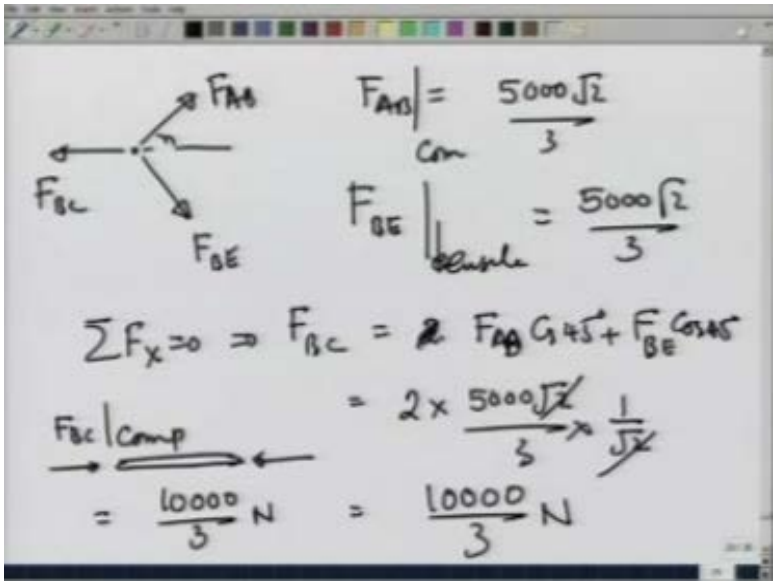

And F B C working this way, F A B is pushing the pin out. So, this is compressive is 5000 root 2 over 3F B E. We have just determined, but F B E pulls the pin N and therefore, why Newton third law pin pulls it out. This is tensile while its magnitude is 5000 root 2 over 3 and F B C from summation F X equal to 0 would come out to be 2 times the X component of F A B or F B is the same thing.

So, I can write this as actually F A B cosine 45 plus F B E cosine of 45, which comes out to be 2 times 5000 root 2 over 3 times 1 over root 2, which comes out to be 10000 over 3 Newton. And since, the pin is going be pushed out the pin will push the rod N and therefore, on the rod the force F B C is compressive and this is of the magnitude 10000 over 3 Newton. So, now we have found forces, let us make this truss again.

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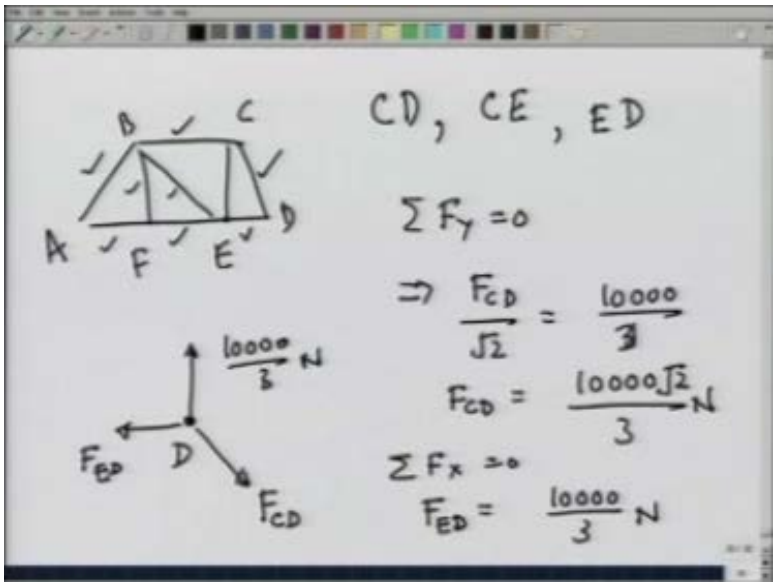

In this member, in this member, in this member this member, this member and this member only members, which are left are A B C D E F the members C D, C E and E D 1 can keep going from B onwards to C, and D, and E or work from B backwards. For example, point D, we have already calculated that there is a force of 10000 over 3 Newton working upwards due to force due to the C D. There will be a force F C D acting this way, this would give an X component and to balance that I should have a force F E D acting this way.

So, this is point D summation F Y is equal to 0 gives me that F C D over root 2 should be 10000 over root 3 10000 over 3 or F C D is equal to 10000 root 2 over 3 Newton. And therefore, again by summation F X is equal to 0, I will get that FED is equal to 10000 over 3 Newton. So, immediately we found the force in this member as well as this member. The only member now left is F C E.

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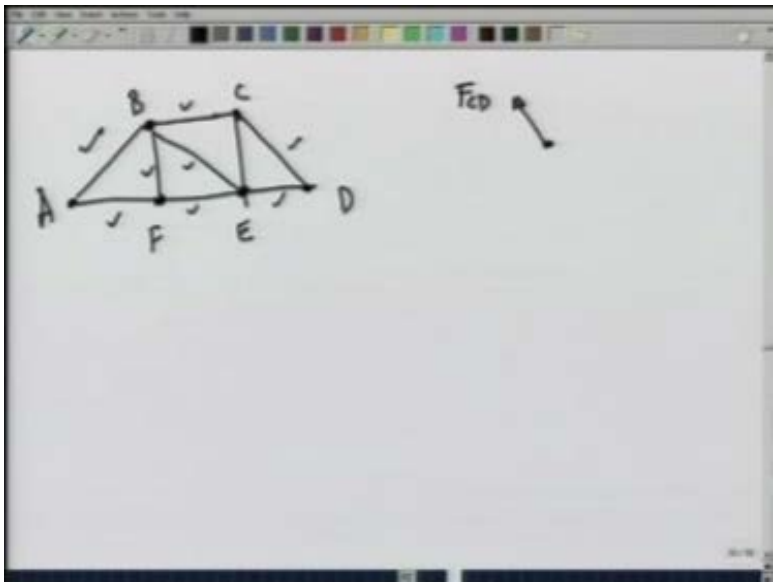

Let us now calculate the force on the member that is now, left that is F C E this we have calculated, this we have calculated the only member left is F C E. Let me write this again A B C D E F for this. I will take point C, which is an equilibrium under the forces of F C D. We have already calculated F C D to be of compressive nature. Therefore, it pushes see out then there is a force F B C, which we have calculated earlier.

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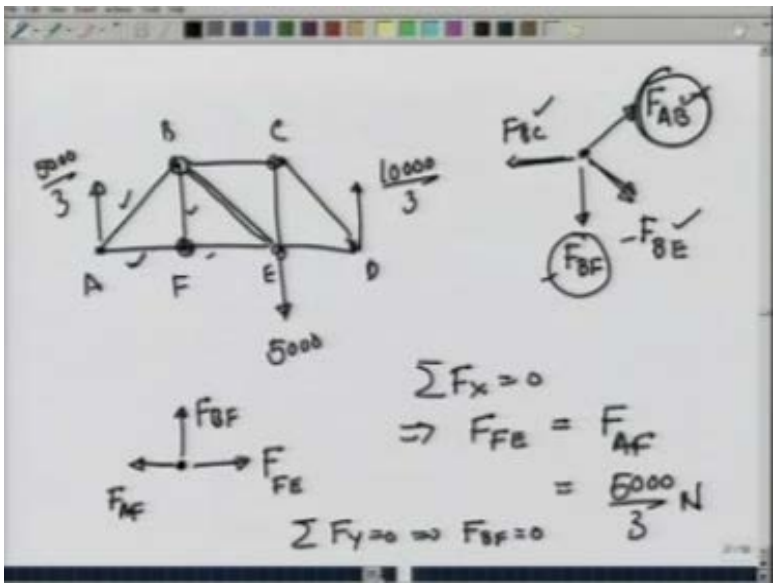

And let me just have a look at that F B C was calculated to be.

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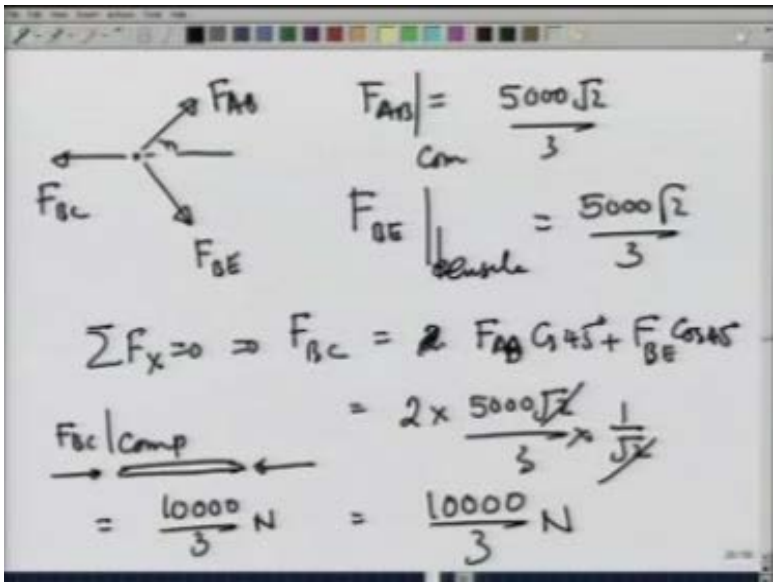

F B C was to be 10000 over 3 Newton, and it was compressive.

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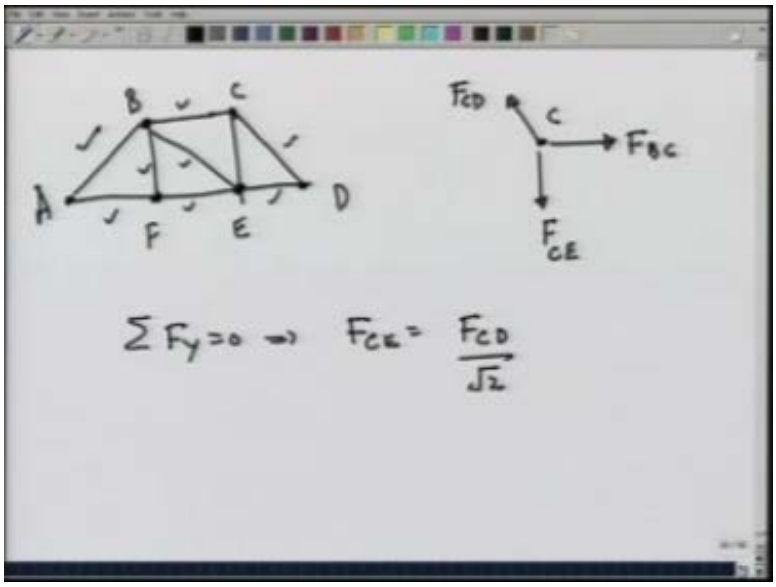

So, F B C was compressive and therefore, it will push point C. In this manner F C E is what we want to calculate and these are the 3 forces under which the system is in equilibrium right away. You can see that summation F Y equal to 0 would give me F C E to be equal to F C D over root 2.

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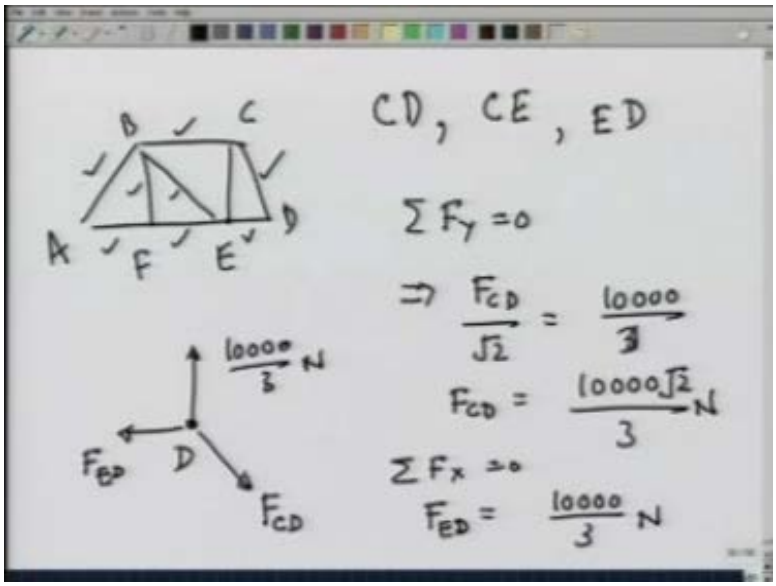

And we have already calculated F C D to be 10000 over 3 times root 2 Newton and therefore, we get this to be 10000 over 3 Newton.

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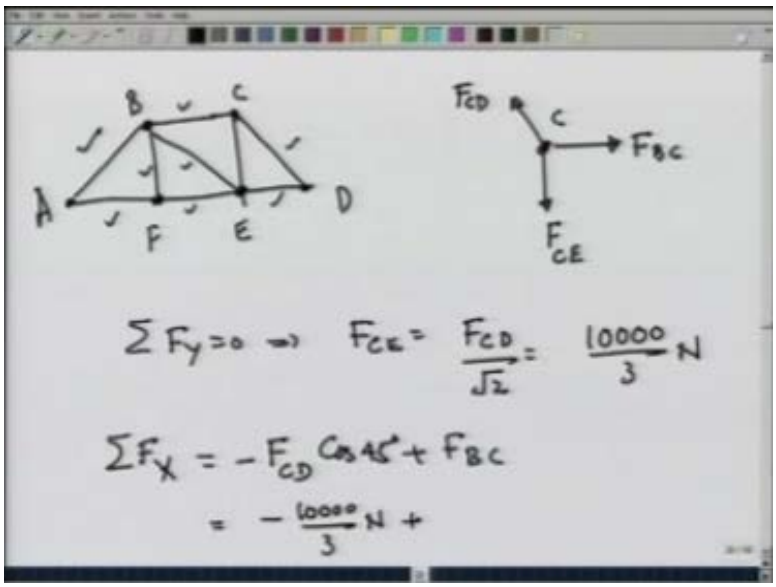

At this point we can also make a consistency check because at this point, if I have done my calculations correctly the X component must vanish automatically. That it does, we can see, because this is F C D with a negative sign cosine of 45 degrees plus F B C, F C D was calculated to be 10000 over 3 root 2. So, this comes out to be minus 10000 over 3 Newton plus F B C was calculated to be.

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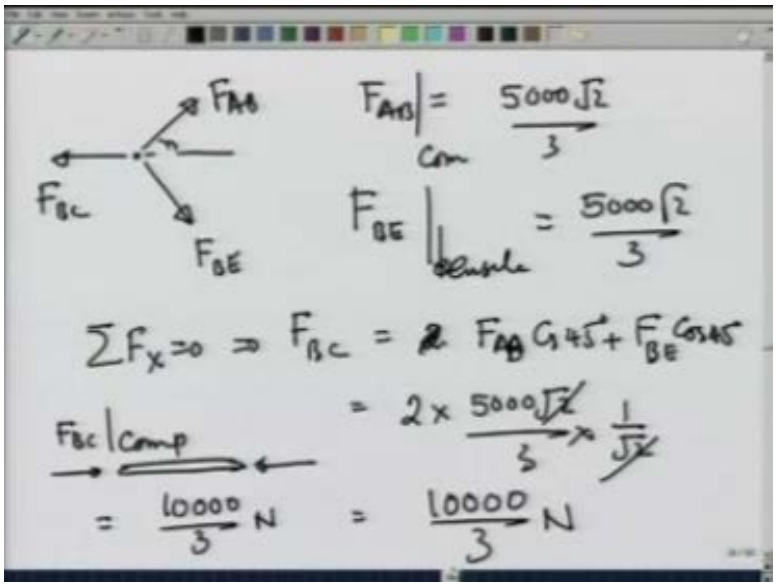

And we can see that from the previous slides F B C was calculated to be 10000 over 3 Newton.

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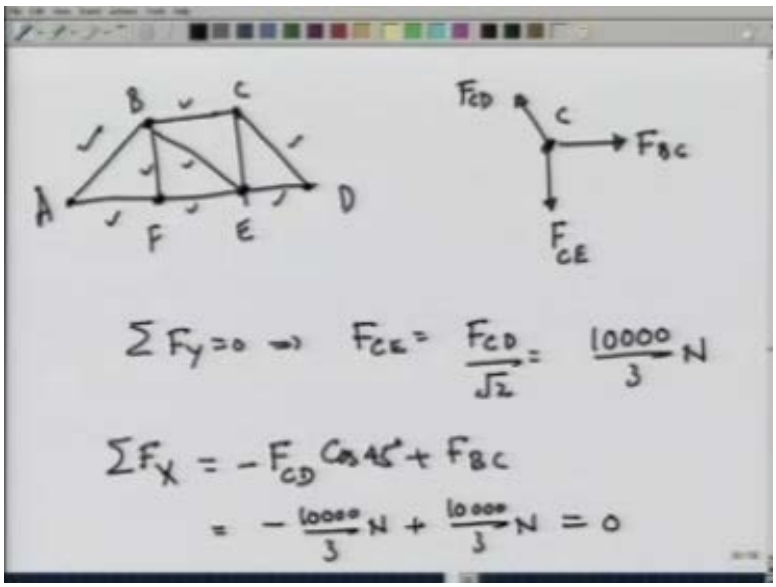

So, this comes out to be 10000 over 3 Newton, which is 0. So, we are consistent in our calculations. Let us now template all the forces, all the forces that we have calculated.

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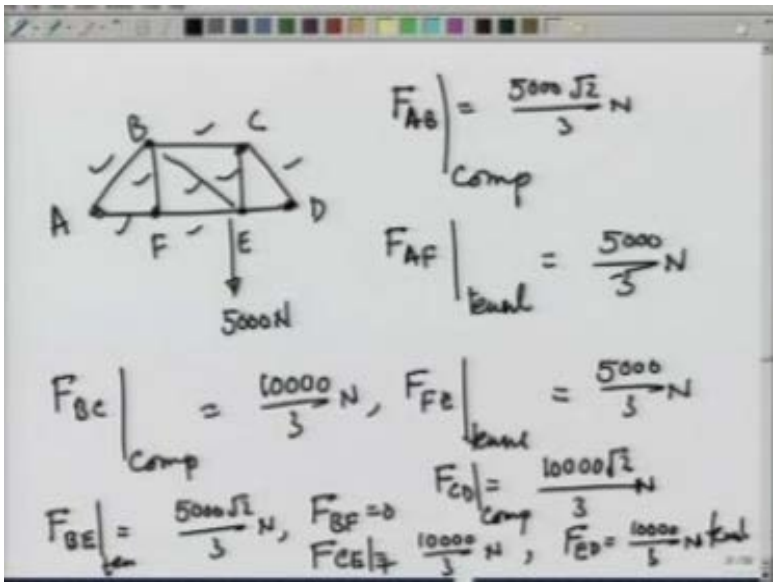

All the forces that we have calculated are A B C D E F when these truss is loaded with the 5000 Newton load at point E are F A B, which came out to be 5000 root 2 over 3 Newton and this was compressive. Then, F A F, which was tensile and it came out to be 5000 over 3 Newton. Then, F B C which came out to be compressive, and its value was 10000 over 3 Newton. Then, F F E which came out to be tensile again, and its value was 5000 over 3 Newton 1 2 B C,F E are done 4 1 2 3 4 members.

Then, F B E came out to be tensile as value was 5000 root 2 over 3 Newton F B F came out to be 0. So, Newton B F Newton B E, F C D came out to be 10000 root 2 over 3 Newton and the source compressive F C D. We have done F C E came out to be, we just calculated this 10000 over 3 Newton tensile and F E D came out to be 10000 over 3 Newton tensile. You can go back and check these answers yourself. Next question is, what happens, if each of these members in addition to this load had weighed themselves.

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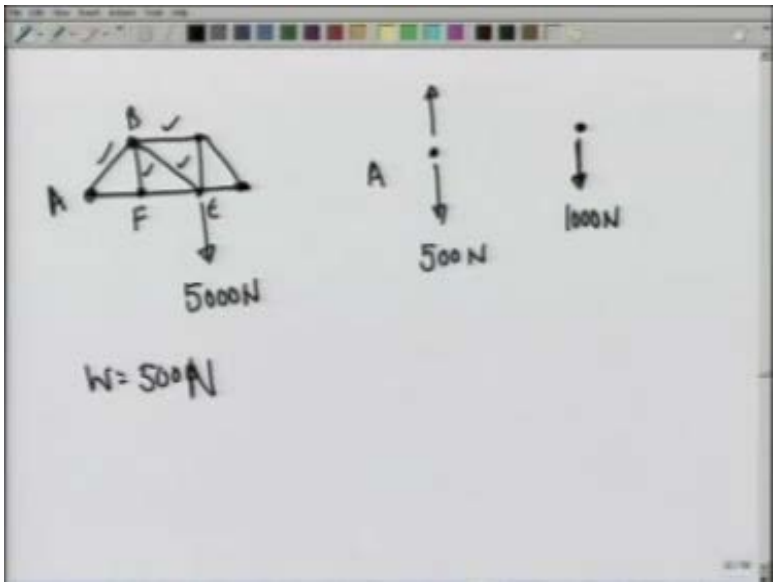

So, here is a load of 5000 Newton, if each member. Let us say, have a weight of 500 Newton, in that case, as I remarked earlier what we would do is divide this weight equally at each point. Thus pin A would carry the weight of member A B, which is 250 and member A F, which is 250 additional weight of 500 Newton. The reaction will change correspondingly point; point B would carry the weight of A B, B F, B E and B C. So, you carry an additional weight each half of each. So, 250 times 4000 Newton in addition to whatever is being done.

I would leave this exercise for you to complete, as to how the forces in each member would now change, when I put this additional load due to the weight of each member on to these pins. As a final example, now the method of joints, I am going to solve the problem again based on a problem from the book of Merriam on statics.

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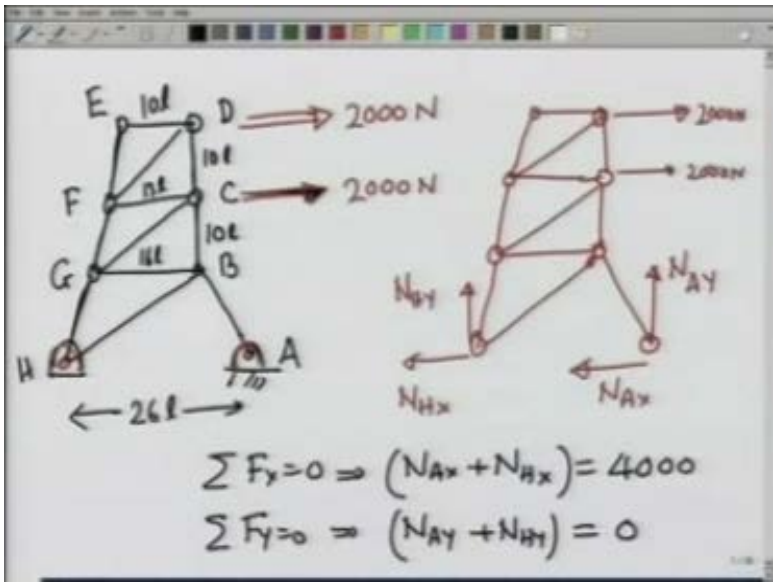

This is a truss like this where the lower point here is fixed. These are joined like this by rods, and this point is also joined by rods and this point is then fixed here at point A. So, this is a truss A B C D E F G and H notice that these likes H G, G F, and E F are slightly slanted B C and D C are vertical. This is 10 l in length. So, is E D 10 l, this is 13 l F C is 13 l GB is 16 l, and this length is 26 l.

The truss is loaded at points seen. Let me make this in red at points C, and at point D by 2000 Newton each. We want to calculate the forces on different members notice. Since both point A and H are on fix pins, this problem is statically indeterminate externally. Let us see, how? So, if I take this structure, then there is a vertical force here. Let us call it N AY and in anticipation. I am already assuming N A X is going to be to the left. Similarly, N H X is going to be to the, to the left and N H Y, and there is a load 2000 Newton 2000 Newton. Then, the condition summation F X equals 0, gives me N A X plus N F X equals 4000.

Notice, that I cannot determine from this equation N A X or N H X separately summation F Y equals 0 gives me N AY plus N H Y to be equal to 0. That means N A Y and N H Y are going to be opposite. The value of N A Y or N H Y can be obtained by applying the torque equation, and we I am going to take the torque about point H.

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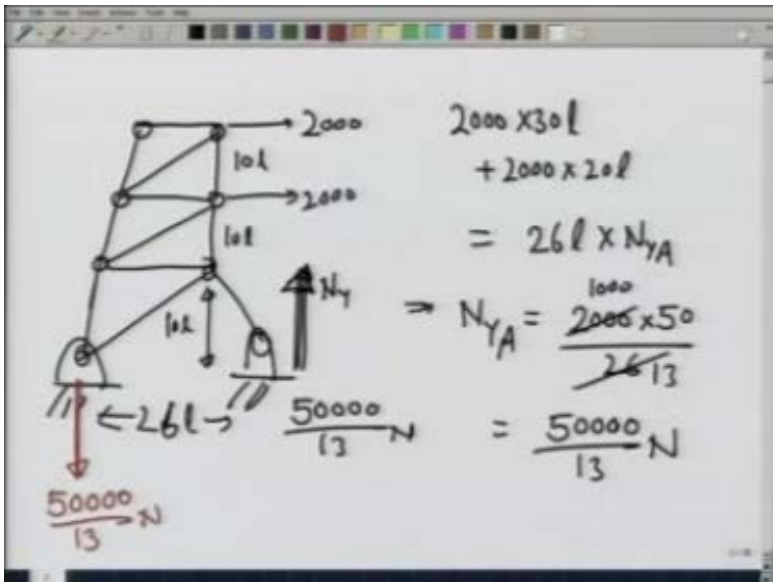

So, if I apply torque about point H. This is 10 10 l, this is also given to be 10 l. Then, by torque equation, I will get 2000 times 30 l plus 2000 times 20 l should be equal. This is N Y 26 l times N Y at A, and this gives me N Y A at point A equals 2000 times 50 divided by 26. That is100013 equals 50000 over 13 Newton in the direction shown.

So, this force up is 50000 over 13 Newton and from the Y force balance equation. The force out here vertical force going to be in the opposite direction 50000 over 13 Newton. This is when the equation we turn the previous page, what we are now interested in is, can we determine the forces on different members of the truss? And this is what I am, we are going to do that next.

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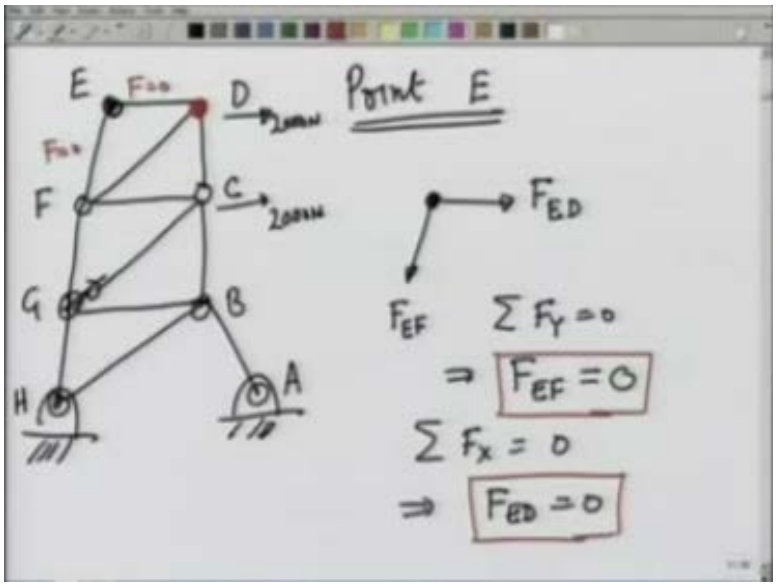

So, let us look at the truss which is like this sorry, this up to this point, this is vertical, this is again. Now, this is A B C D E F G H apparently an indeterminate problem. But let us see, if we can solve for forces in different members to start with. Let us look, at point E and I am choosing point E because from there, we can solve a smart solving things in a very, very simple manner. At point E there are only 2 forces this is of course, loaded with 2000 Newton each.

There is a force, let us call it F E D, and there is a force F E F right away. If, I do summation FY equals 0 this gives me that F E F sin of whatever, that angle is should be 0 and therefore, FE F is 0. If, FEF, is 0 then summation F X equals 0 again implies that FED is 0. So, starting from point E I get 2 answers right away. That the forces in the members F E F and F E D are 0 this force 0, this force is 0. Now, if I go to point D here, there are only 2 unknown forces here F D C and F F D and therefore, I can determine both on the 2 force balance equations. Let us do that.

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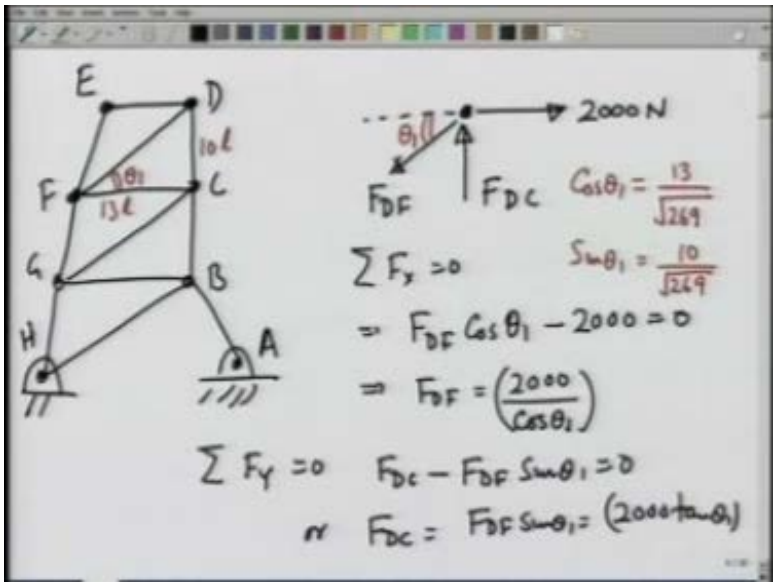

So, if I go to point D let me, again make this structure point D A B C D E F G H at point D, F E D is 0 and there is only 1 load 2000 Newton. There would be a force F D F, and a vertical force and again an anticipation on making it like this F D C. There are 2 unknown and both of these I can determine. Let this angle be theta, and that would be the same angle. As this, this is 10 l, this is 13 l. Let main fact call it theta 1 because I am going to require other angles later by summation F X equals 0.

I get FDF cosine of theta 1 minus 2000 equals 0, and that gives me F D F equals 2000 over cosine of theta 1. Notice, that cosine of theta one from here is going to be 13 over square root of 269 and sin of theta, 1 is going to be 10 over square root of 269. Once I get F D F, I can also calculate F D C from the condition. That summation F Y is equal to 0 and that gives me F D C minus F D F sin theta 1 equals 0 or F D C equals F D F sin theta 1, which is 2000 tangent of theta 1. Let us calculate these numbers. So, the numbers that we get are, let me make the picture again 2000, 2000 0 0 A B C D E F G H.

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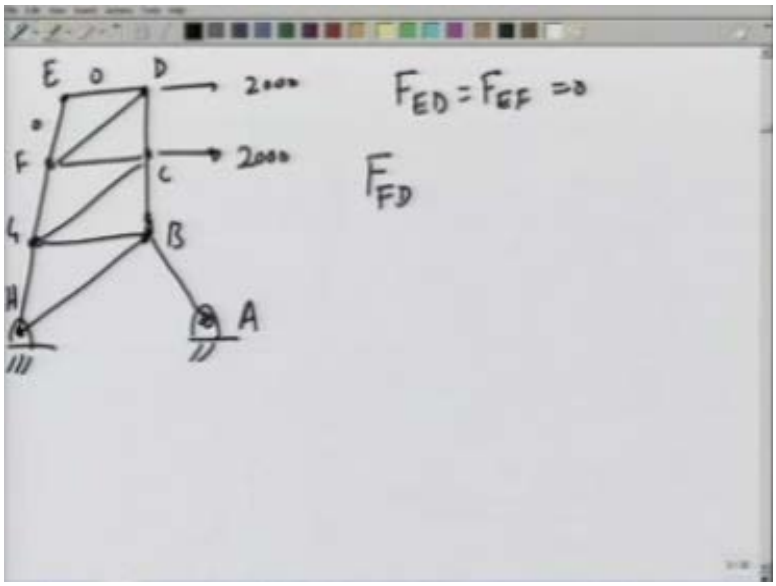

So what we obtained is that F E D equals F E F equals 0, we obtain F F D. I think I called it F F D or D F I called it F D F.

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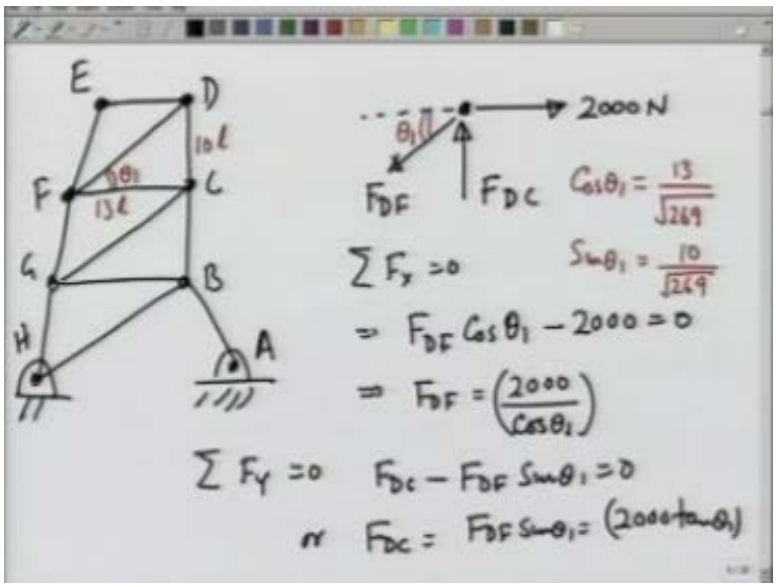

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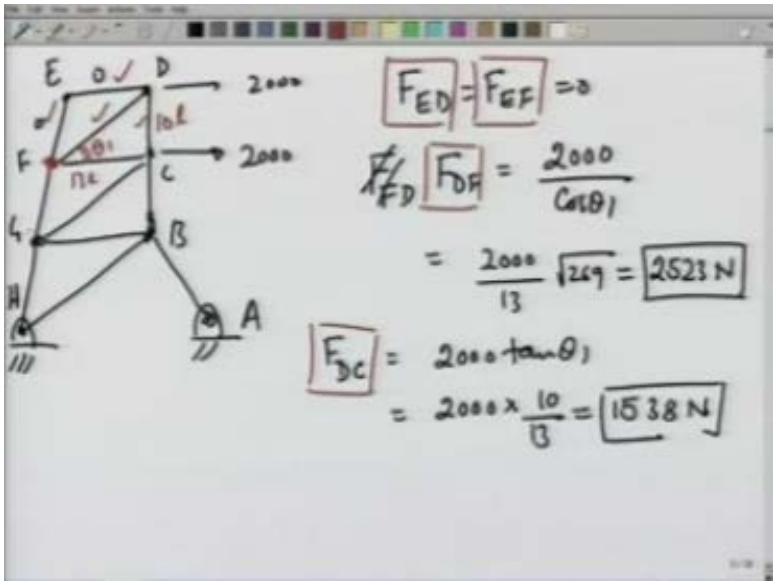

So, F D F equals 2000 over cosine of theta 1. Let me remind you, this is theta 1 this is 10 l, this is 13 l. So, which is equal to 2000 over 13 square root of 269. And F D C, D C comes out to be 2000 tangent of theta 1, which is 2000 times 10 over 13, which comes out to be 1538 Newton. Similarly, then F D F comes out to be 2523 Newton. So, we found the 4 forces F the box. Then, F E D, F E F, F D F, F D C, we found this, we found this we have found this, we have found this..

Now, we can move on to point F because on point F. Now, I know 242 forces F F D and F E F and 2 unknown forces are going to be F F C and F F G. So, with 2 equations I can find these forces also. Let us do that next. So, to calculate the forces on F, let us balances on F, let me make the truss again.

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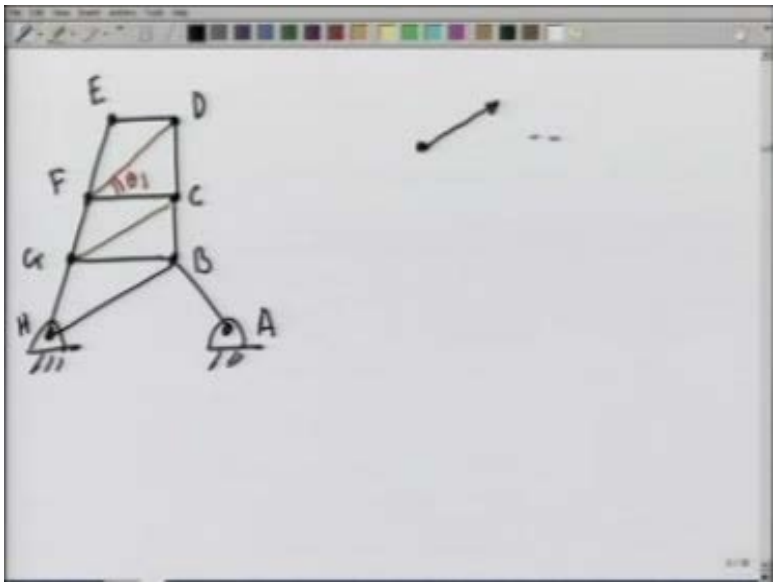

A B C D E F G H and I have already shown you are these are the other lines, this is angle theta 1. If, I look at point F, it has a force E F, which is 0. It has force, do I call it F D or D F?

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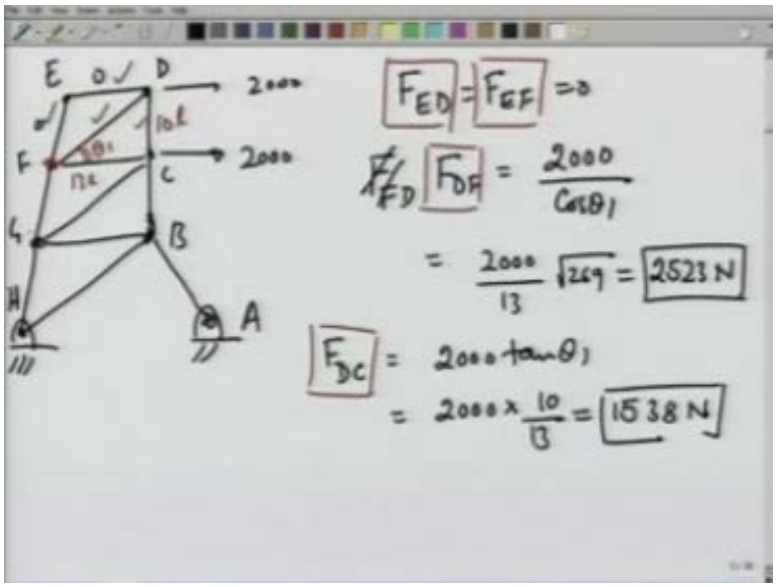

Let me see, I call it D F.

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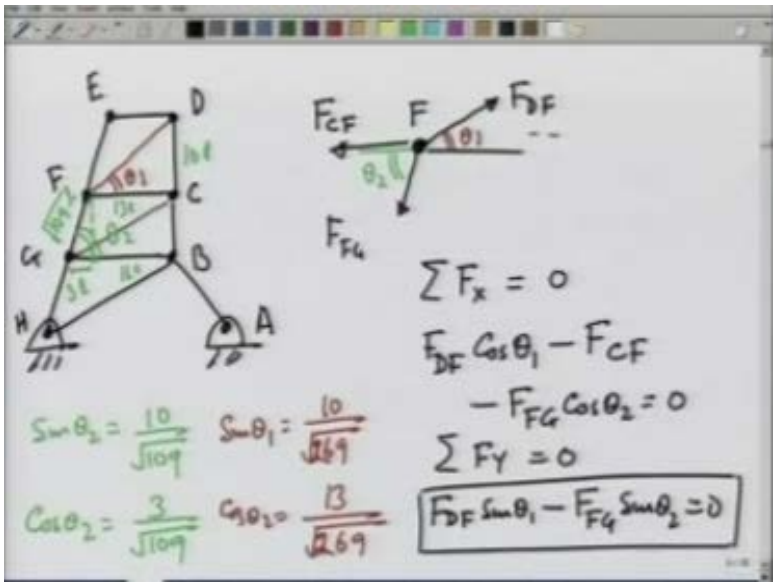

F D F acting at an angle theta 1, then this has a force an anticipation I am going to make the direction now F F G. Let us call this angle at which it is acting theta 2 and therefore, that angle is going to be this angle theta 2, and we calculated sin and cosine. So, on then an anticipation again that make us anticipate, that the force F C F is going to be towards the left. So, this point F is in equilibrium under these 3 forces F D F, F C F and F F D. To calculate sin and cosine of theta 2, let me just drop a perpendicular from here, recall that this is l, this line is 13 l, this is 16 l.

So, therefore, this portion is going to be 3 l. This length F C is going to be 109 l and therefore, I can write sin of theta 2 is going to be 10 over the square root of 109 cosine of theta 2 is going to be 3 over square root of 109. And we have already seen that sin of theta 1 is 10 over the square root of 160. Sorry, 269 and cosine of theta 2 is equal to 13 over square root of 269. Now, summation F X at F equal to 0, gives me F D F cosine of theta one minus F C F minus F F G cosine of theta 2 equals 0. Similarly, summation F Y equals 0, gives me F D F sin of theta 1 minus F F G sin of theta 2 equals 0. On the second equation I can find F F G right away, we call that F D F was 2000 over cosine of theta 1.

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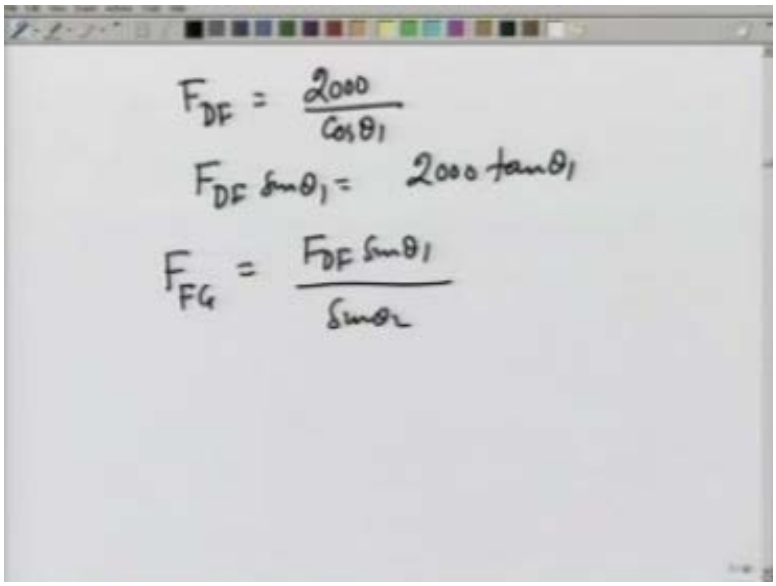

Therefore, F D F sin theta 1 is 2000 tangent of theta 1 and F F G is going to be F D F sin theta 1 over sin theta 2 that we saw from this.

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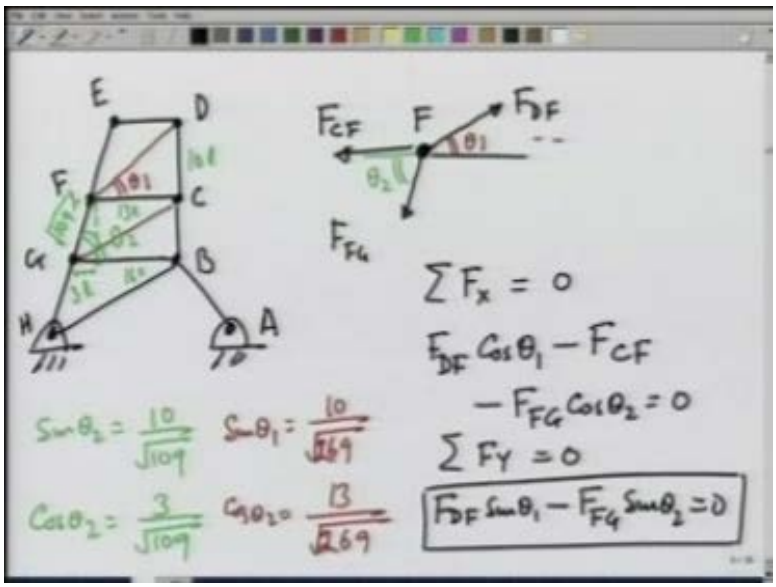

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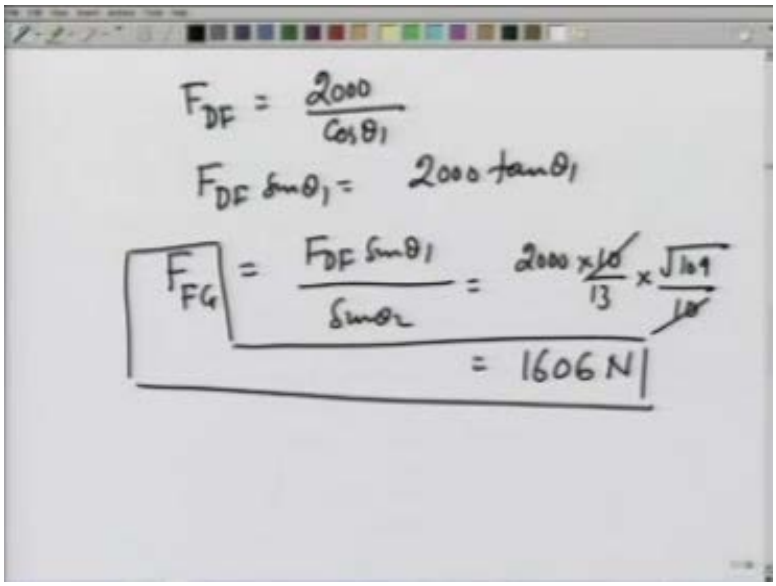

Balance equation which is going to be 2000 times 10 over 13 times the square root of one 0 9 divided by 10. And that comes out to be 1600 and 6 Newton. So, we found F F G also having found F F G.

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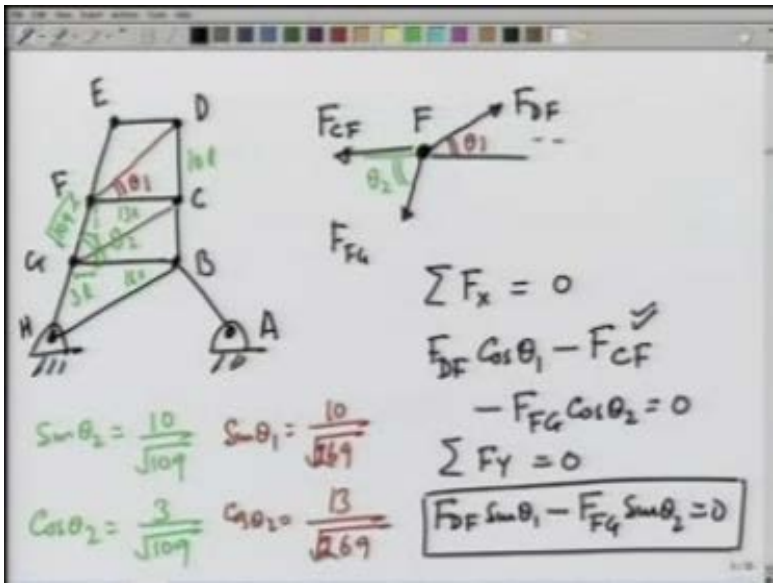

We can now calculate F C F also because F C F, then is going to be.

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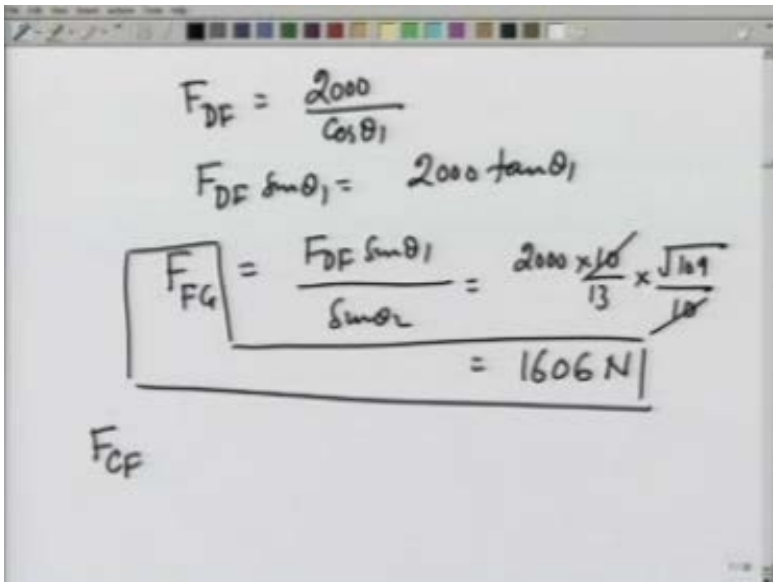

F C F from the previous equation.

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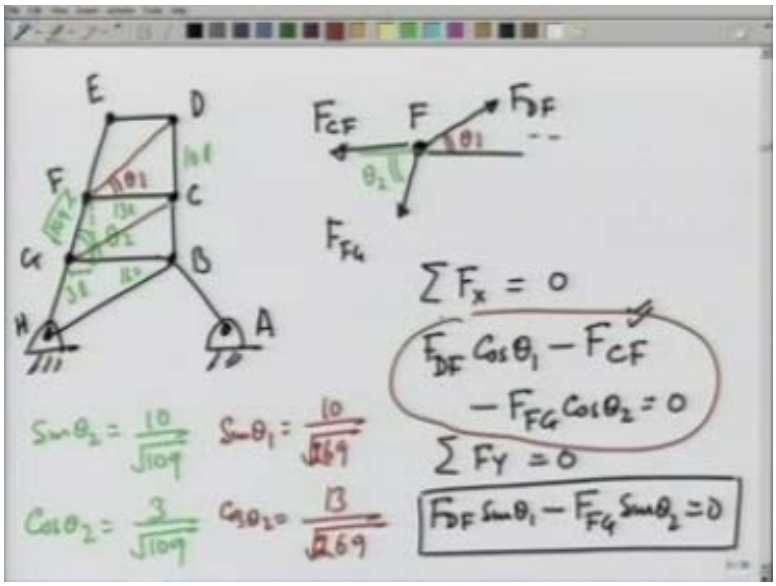

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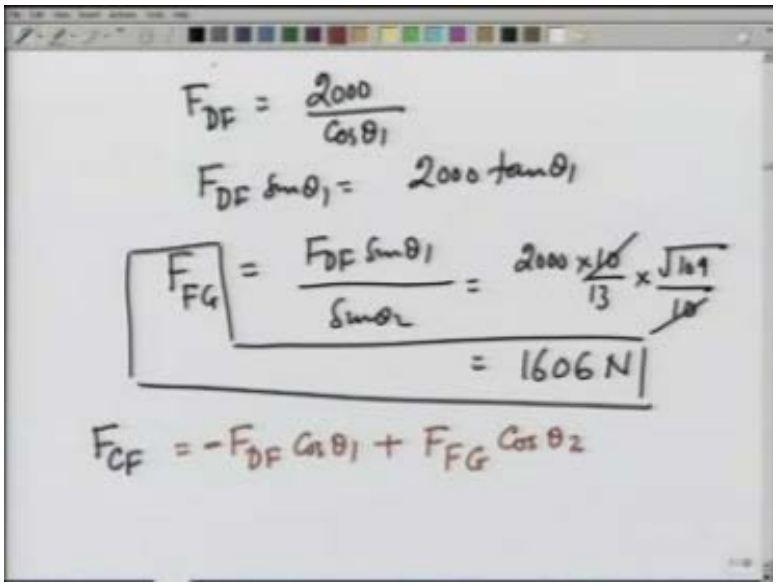

If you look at this equation is F D F cosine theta 1 minus sin plus F F G cosine of theta 2. You plug in the numbers F D F cosine theta already know is 2000. So, this is or we get the numbers right signed right.

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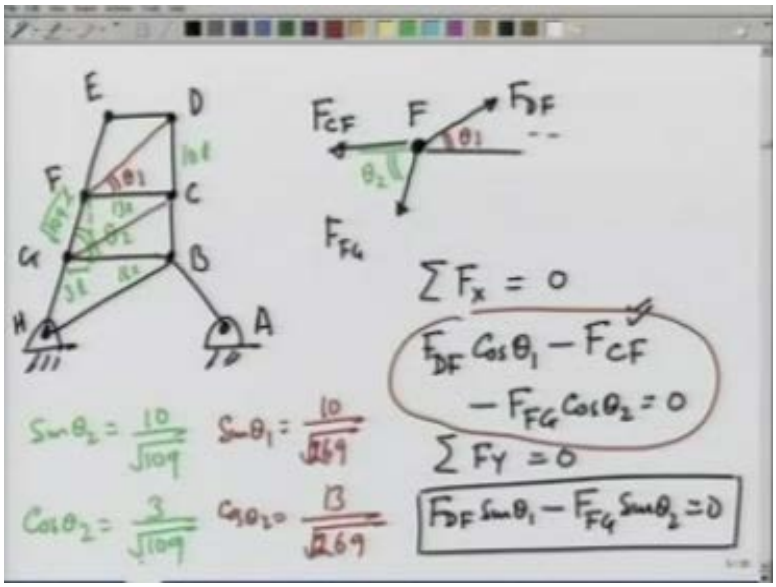

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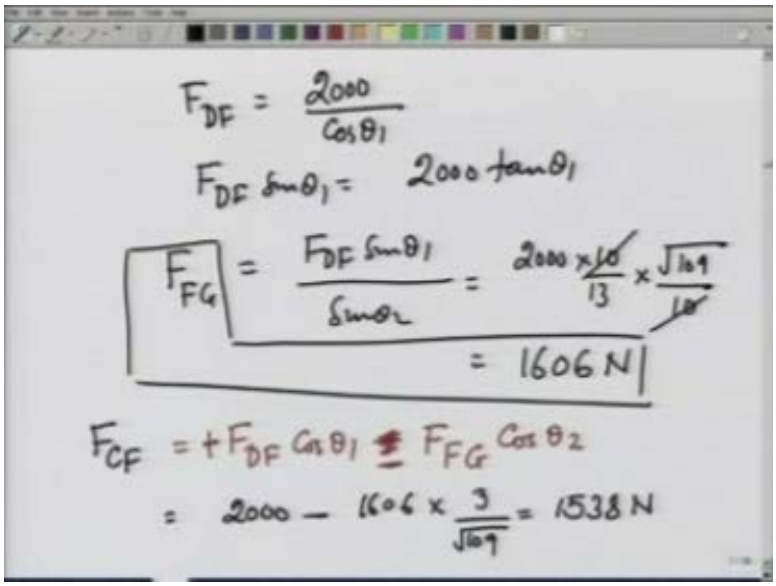

Let us check that we plus N minus so, this is plus and this 1 is minus. So, that the derivation that we have anticipated is already correct. If, you plug in the number this comes out to be 2 2000 minus F F G 16 cos 6 times cosine of theta 2, which is 3 over root 109. And if you calculate this it comes out to be 1538 Newton. So, let us see what all forces that we found in the truss.

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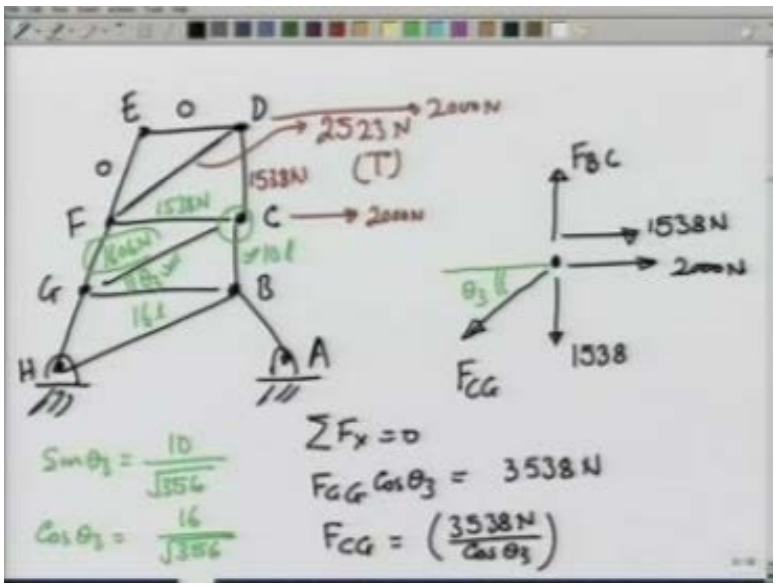

This is a truss, we found this force to be 0, this force to be 0, we found this force. Let me put it in red, we found this force. Let me just write this first A B C D E F G H. So, we

have found this force F F D to be 2523 Newton. This is the force loaded with 2000 Newton this way and 2000 Newton this way and this force is tensile because it pulls D N. Similarly, now we have found F D C, this force which is 1538 Newton.

We have found F C F, which is also 1538 Newton and we have found F F G, which is 16 Newton this force. Similarly, now I can go on now, you see if I look at point C there the 2 forces 1538 and 1538 Newton are known here. And therefore, I can calculate F C G and F C B by balancing forces on point C. So, let us balance the forces on point C on point C. There is a load of 2000 Newton acting this way F F C is a compressive force because it was pushing point F outwards. So, here also it pushes point C this way 1538 Newton.

Similarly, F C D which is a force, which was pushing point D up is going to push this point C down with 1538 Newton. Then, an anticipation we are going to have F C G acting in this way and F B C acting up the 2 unknown forces here are of course, F B C and F C G. Let us look at these lines, this length is 10 l, this is 16 l. So, if I look at this angle and let me call it theta 3. I am going to have F C G, C G acting at an angle theta 3 with sin of theta 3 equals 10 over square root of 356 and cosine of theta 3 equals 16 over square root of 3 56.

Now, we are ready to calculate F B C and F G C. So, let us do summation F X equals 0, which gives me F C G cosine theta 3 equals 3500 and 38 Newton. And therefore, F C G is equal to 3538 Newton divided by cosine of theta 3. I can plug in the numbers and get my answer. Once, I have known that I can also calculate F B C by saying that summation F Y equals 0.

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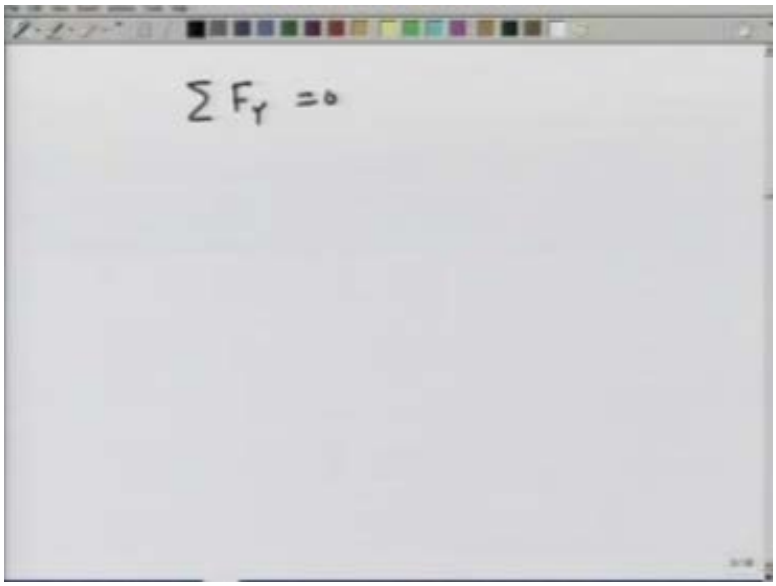

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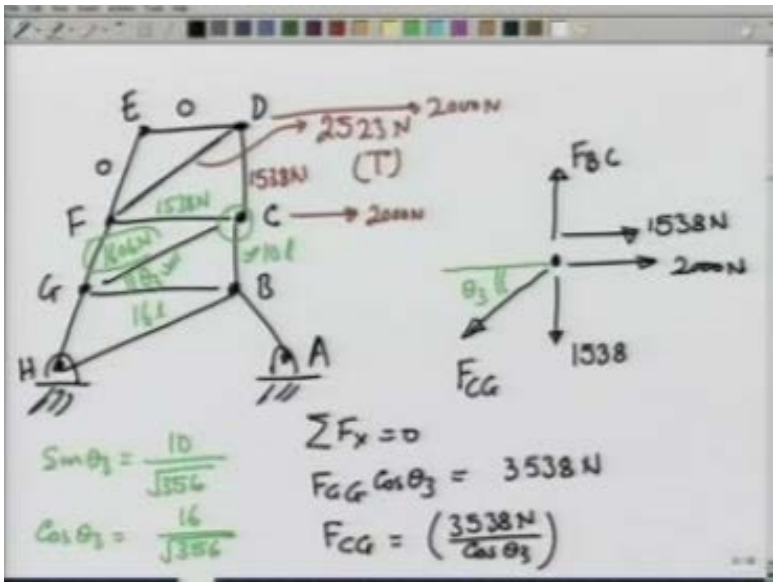

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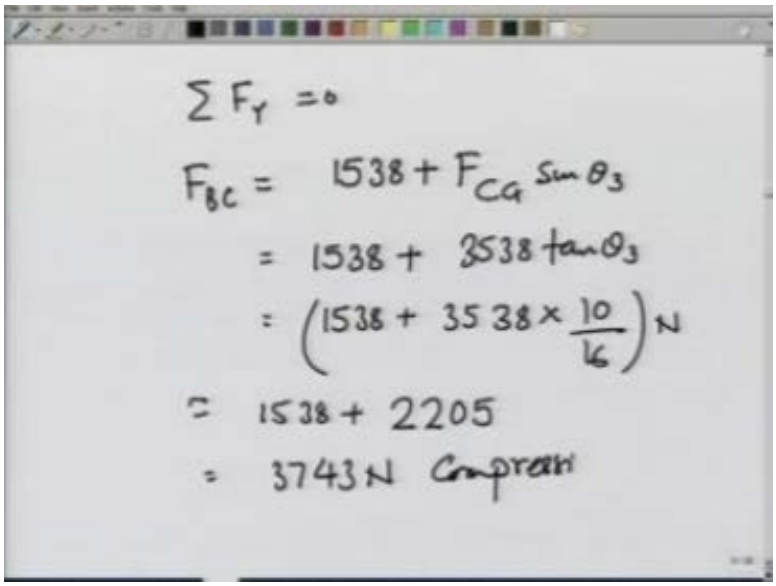

In this case gives me F B C equals 1538 plus F C G sin theta 3, which is 1538 plus 3538 tangent of theta 3 which is nothing but 1538 plus 3538 times 10 over 16 Newton, which is approximately 1538 plus 5, which is 3743 Newton and as pushing point B up. And therefore, this is compressive. So, we have calculated forces up to G C and B C. If, I know other angles I can go further and calculate all the forces in all the members having done method of joints.

Now, we go to other method called method of sections, where if the number of joints becomes too large that method comes out to be handy. Imagine a huge a big truss where you have to keep going from 1 point to the other the method may become a very time consuming method.

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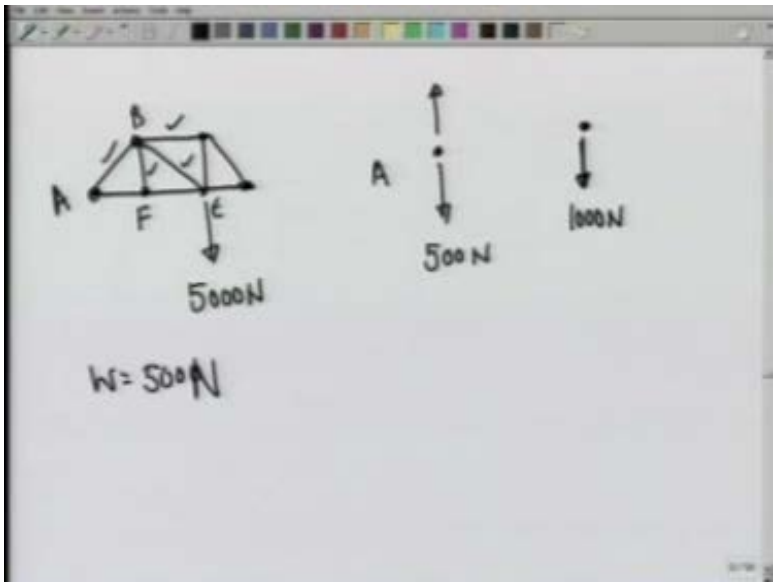

In that case the method that is used is known as the method of sections.

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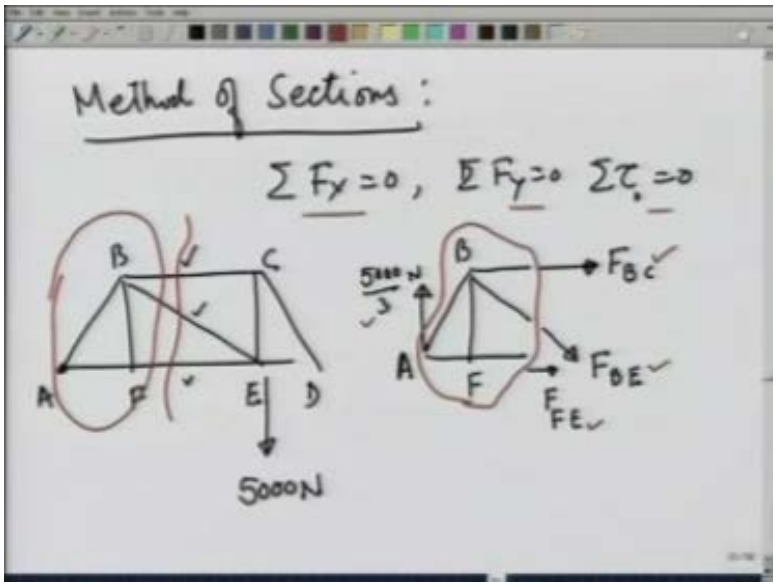

In which case, we cut a section through the truss. So, that maximum of 3 members are cut, and then I have 3 equations to solve namely summation F X equal to 0 summation F Y equal to 0 and summation tau A B out some point equal to 0 that give me those 3 forces. Let me illustrate, this method again by the same truss that we have solved. So, far A B C D E and F, and here is a load of 5000 Newton.

Suppose, I want to now get it the forces in members B C, B E and F E, what one would do in that case is make a cut through these members and look at this section of the truss and see how this is an equilibrium in particular. If, I make this section A B, I made a cut here, I made a cut here and I made a cut here. A B F this member would be pulled this way by a force F B C, it does not matter what direction you take if the direction is opposite. You will get a negative sign already; we have seen that at A there is a force of 5000 over 3 Newton. This may be pulled this way by F B E and this way by F F E.

So, now this section of the truss is in equilibrium under the forces F B C, F B E and F F E, and the force 5000 over 3 Newton, which is known already. I have 3 unknowns and 3 equations namely summation F X equals 0 summation F Y equal to 0 and summation tau is 0. So, I can solve for 3 these unknowns. Let us do that. So, what I have is this section.

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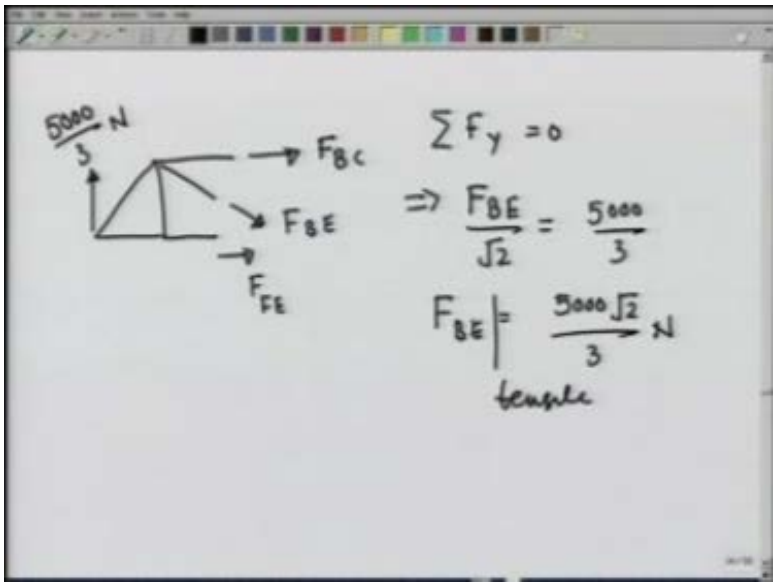

Of the truss this is being pulled, this way by force F B C, this is being pulled this way by force F B E, and this is being pulled this way by force F F E. And there is a net force A F, which is already being solved for 5000 over 3 Newton right away summation F Y equal to 0 gives me that F B E over root 2 is equal to 5000 over 3 or F B E equals 5000 root 2 over 3 Newton. And you can see that this is actually pulling the rod. And therefore, this is going to be a tensile force. Let us compare, this what we had gotten earlier.

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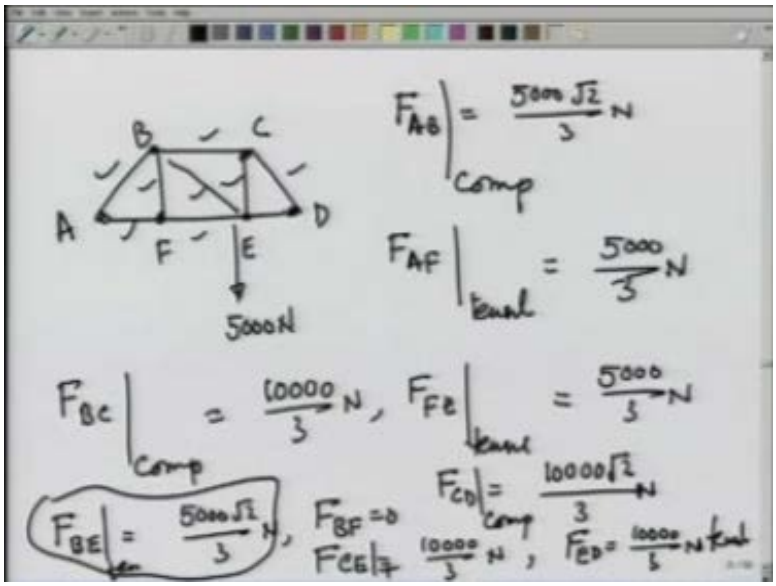

We had obtained F B E to be tensile of 5000 root 2 over 3 Newton.

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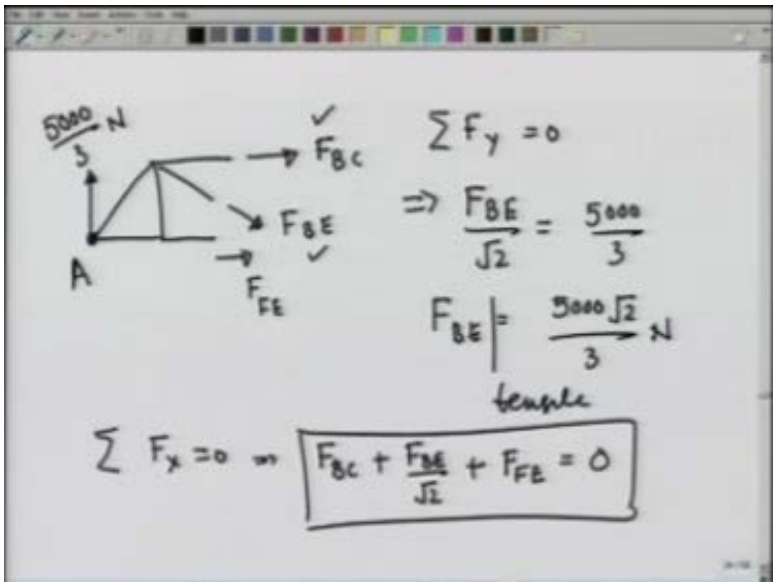

Now, summation F X is equal to 0, gives me that F B C plus F B E over root 2 plus F F E is equal to 0 only F B E is known. And therefore, F B C I will get relationship between F B C and F F E from this equation I cannot get it. So, what I will do is instead of go with torque equation A B out this point. If, I calculate the torques A B out point A 3 are 2 torques F B C and due to F B C and F D E acting on the truss, and these torques must add up to 0, and that is what will give me F B C in terms of F B E. Let us do that next.

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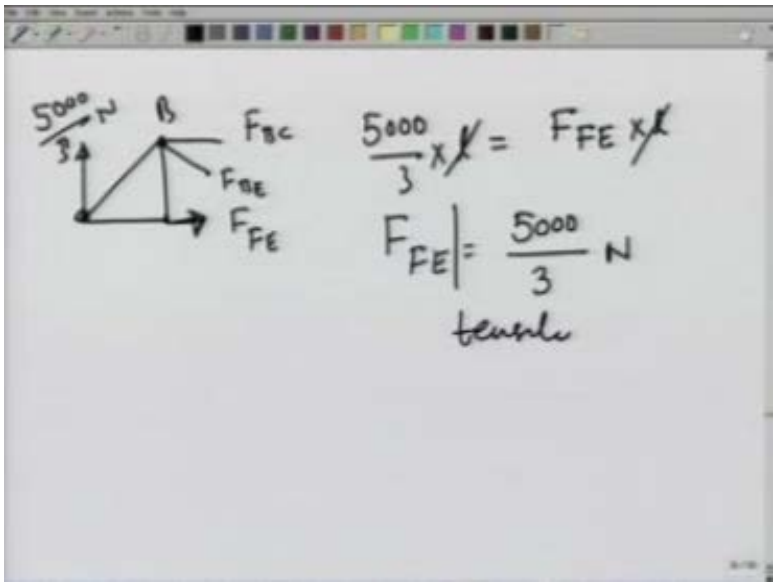

So, these are the forces, which are acting F F E, F B E, F B C 5000 over 3 Newton. Either, I can take torque A B out this point and calculate B C F, F B C in terms of B E easier would be to take torque A B out point B and balance the torques due to F F E and 5000 over 3 Newton. And that gives me 5000 over 3 times l 1 way is equal to F F E and the direction is also correct as l l cancels and F F E comes out to be 5000 over 3 Newton. This is also pulling the rod and therefore, F F E is tensile and you can compare with the earlier answer where we have calculated F F E to be tensile of 5000 over 3 Newton.

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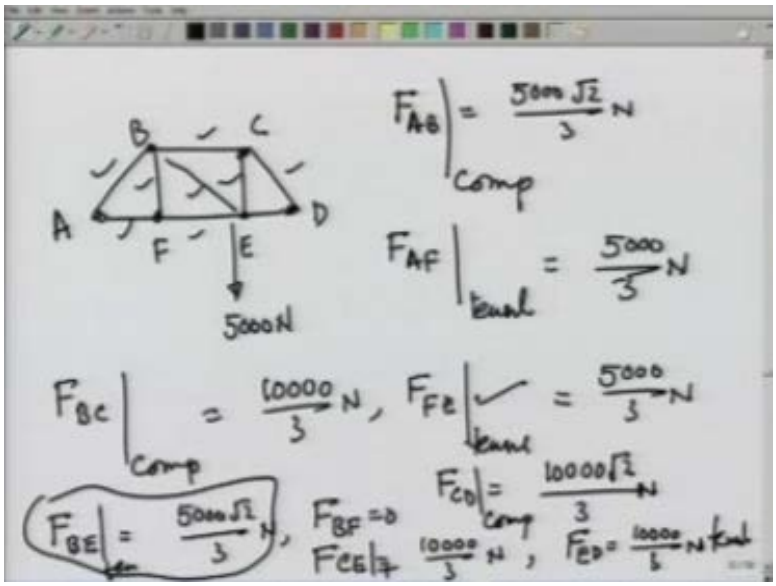

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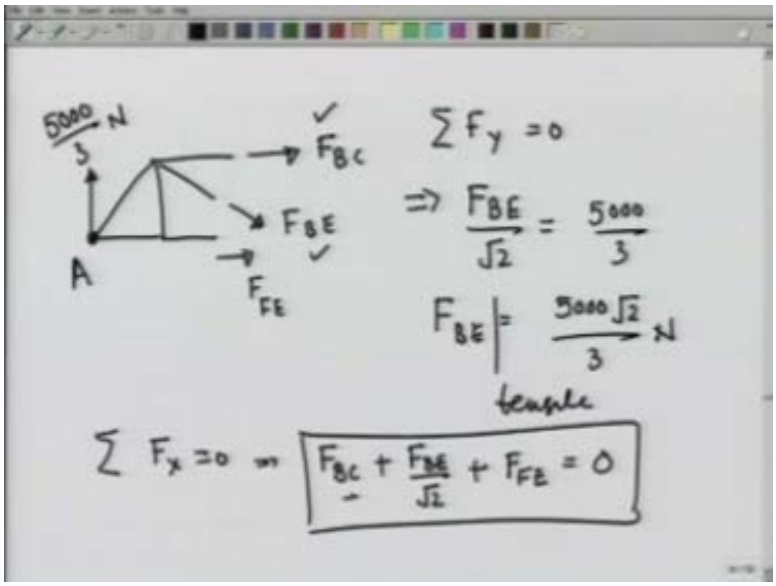

Now, using the equation summation F X equal to 0. I can also calculate F B C and let us do that.

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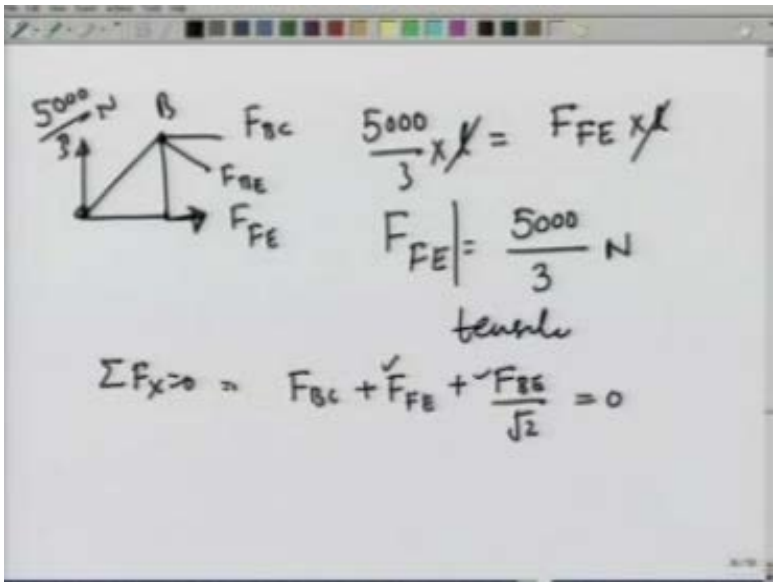

We have summation F X equal to 0, which gave me F B C plus F F E plus F B E over root 2 is equal to 0. We have already calculated F F B and F B E, F B E is equal to 5000 root 2 over 3 and that gives me.

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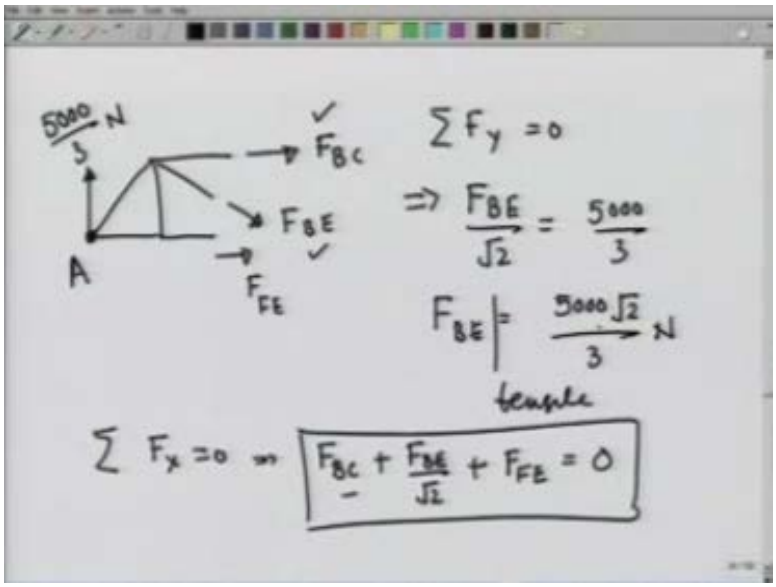

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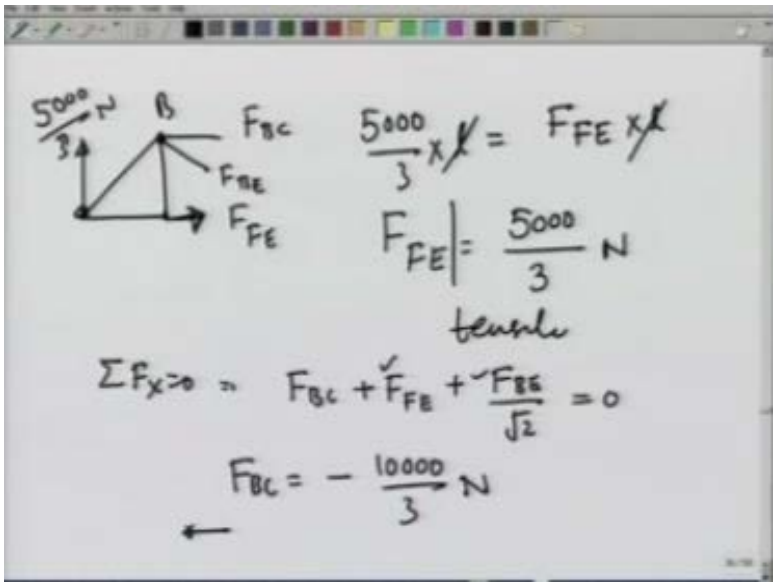

F B C is equal to minus 10000 over 3 Newton and this is coming with the minus sign. Therefore, F B C is in the opposite direction and is compressing rods. So, F B C is 10000 over 3 compressive forces, which we had of course, obtained.

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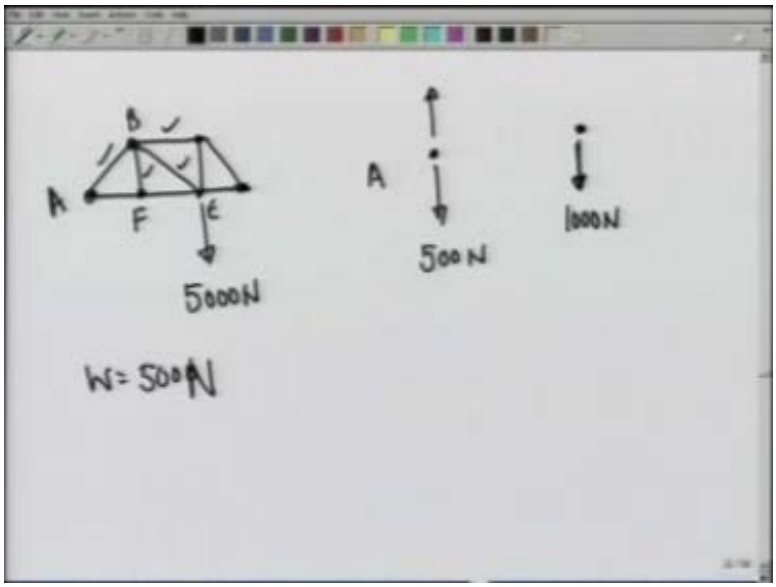

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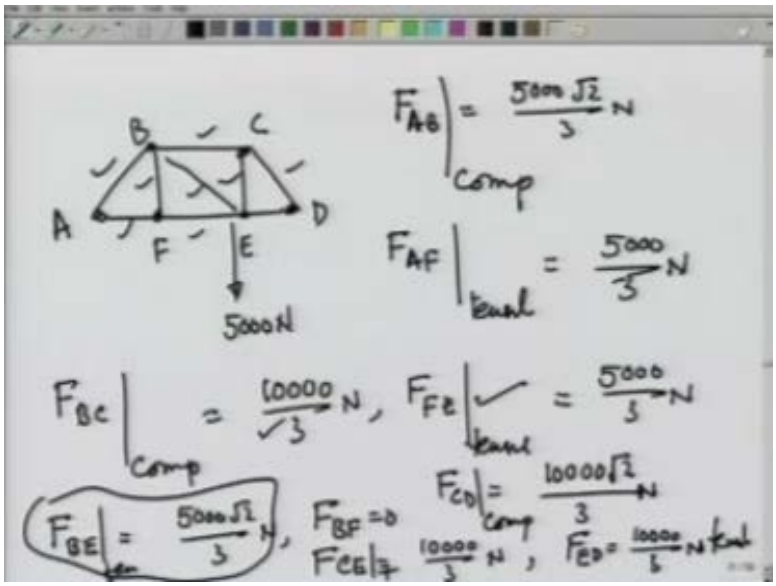

Earlier as we can see F B C was compressive 10000 over 3 Newton. So, we have learned two methods of analyzing forces in a truss.

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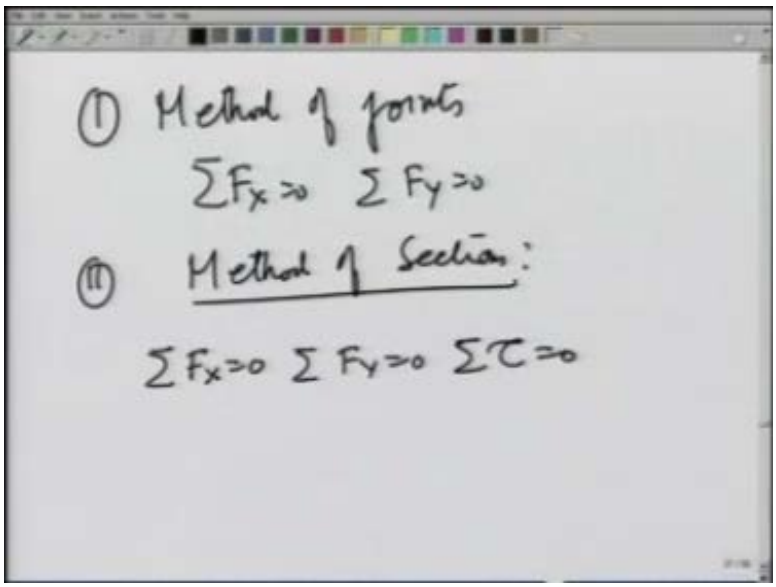

One is method of joints, where we take each pin joint and make an apply equilibrium conditions there. There is no torque involved there because for each pin joint. The torque due to force is passing through that joint are 0 and therefore, the only conditions we have our summation F X equal to 0 summation F Y equal to 0. In other method, that we have seen, is method of sections, which can be applied to selectively calculate forces and

different members of a truss, what is done in this is a section is made where maximum of 3 forces are passing through because the equation that we apply are 3 numbers, 3 number F Y equal to 0 and summation torque equal to 0.

So, in any calculation maximum forces, I can calculate are 3, so section is made. So, that there are maximum 3 forces through that section and we apply the equilibrium conditions to get these forces. This is a simple plane analysis of trusses to summarize what we have done is analyzed plane trusses and gotten forces in them. In an advance what you will be learning is how to analyze 3 dimensional trusses, and also how to take deformation with these into account.