Fundamentals of Electrical Engineering
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Lecture – 53
Magnetic Circuits (Contd.)

Ok, we have back again. So, next will see the reflected impedance right up to mutually your couple coil and after that will see that numericals.

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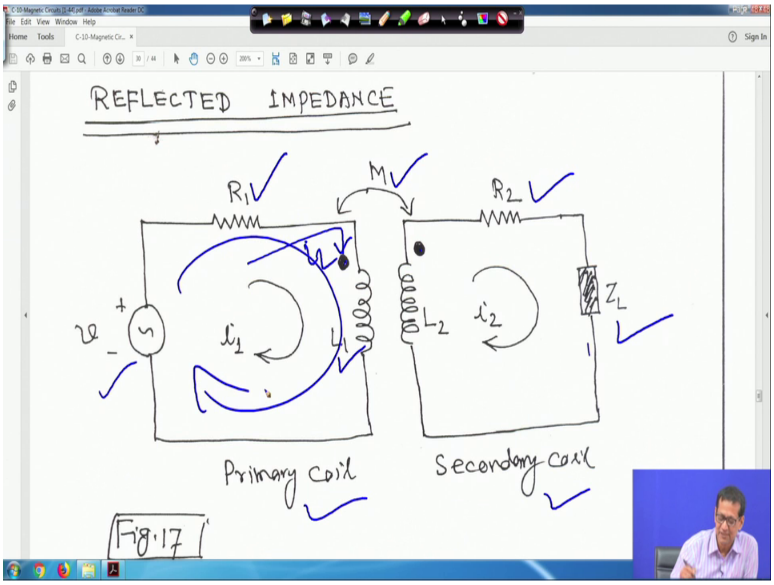

So, in this case your in this case two coils are there dot conventions given their mutual inductance is M and this is one load impedance is that Z L this is the primary coil this is a secondary coil here, resistance is R 1 here resistance is R 2 here inductance L 1 means reactance is j omega L 1 here it is j omega L 2 and mutual inductance is then this is the voltage source this circuit is close actually right and current is taken i 1 and i 2.

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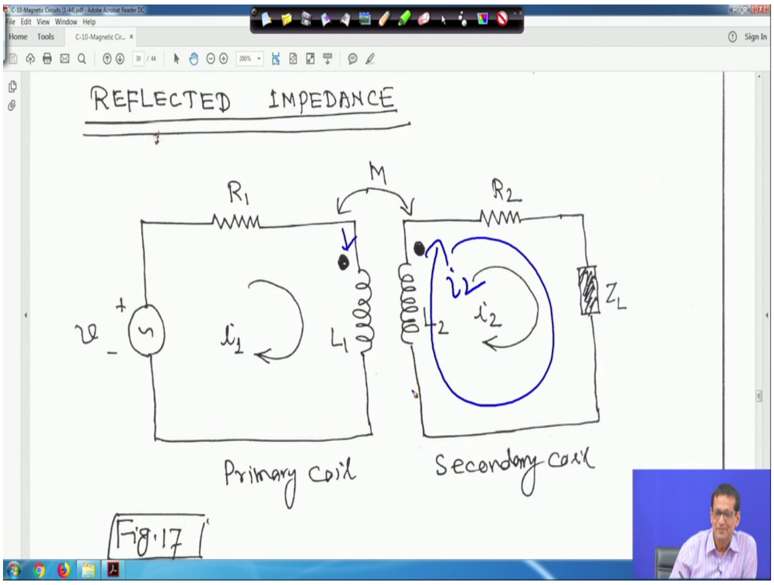

So, in that case if you look into that that if you when in this coil the current is entering into the dot i 1 current this is i 1 current thus current is moving like this is i 1 current. So, here current is entering dot, but in this case the i 2 current is current actually leaving the dot right. So, this why we have to see first right, so that means, sign will be that mutual you are not required mutual inductance voltage generator that sign will be negative. Because current here is entering here it is leaving so, based on that. So, little bit and this is Z L impedance Z L is given based on that if you write in the first in this in this loop if you write your KVL.

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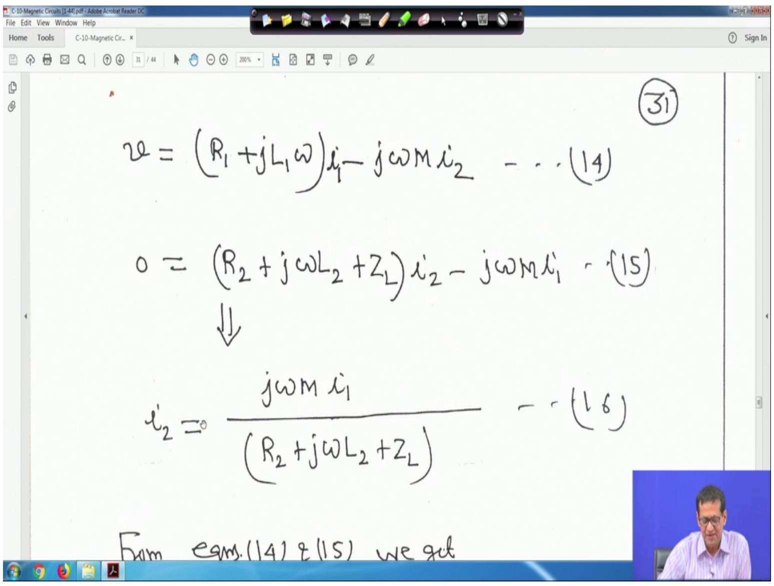

$$v = (R_1 + jL_1\omega)i_1 - j\omega M i_2 \quad \cdots (14)$$

$$0 = (R_2 + j\omega L_2 + Z_L)i_2 - j\omega M i_1 \quad \cdots (15)$$

$$\Downarrow$$

$$i_2 = \frac{j\omega M i_1}{(R_2 + j\omega L_2 + Z_L)} \quad \cdots (16)$$

So, it will be V is equal to R 1 plus j L 1 omega into i 1 minus j omega M i 2, I told you the sign will be minus because current here is entering and it is leaving now you have taken, this is equation 14 say here in this loop p where there is no voltage source here.

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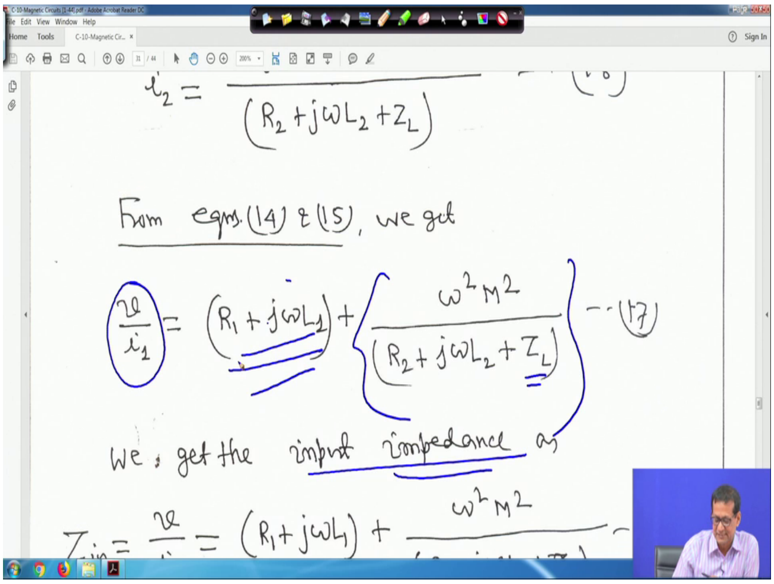

So, 0 is equal to R 2 plus j omega L 2 plus Z L because this is the load impedance is there Z L, right i 2 minus j omega M i 1, this is this part due to the your mutual coupling right this is equation 15. Now if you solve I mean from here i 2 you are getting from this equation 15 j omega M i 1 upon R 2 plus j omega j omega L 2 plus Z L, this is equation 16. So, from equation 14 and your 15 we get V upon R 1, you please solve this one right I have written directly to save time you please find out what is v upon i 1? You will get R 1 plus j omega L 1 plus that this term you will get omega square M square divided by R 2 plus j omega L 2 plus Z L right this is this was the when mutual was not there. So, this is your impedance of that coil 1, R 1 plus j omega L 1 right.

So, this is actually we call V upon i 1, this total we call the input impedance. So, this is input impedance and this is the impendence of the coil 1 without mutual inductance right.

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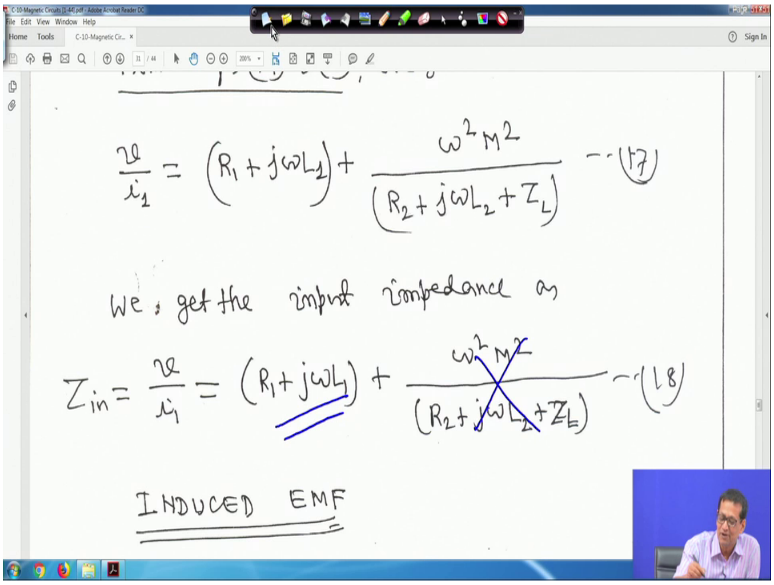

Now so therefore, Z input is equal to V upon i 1 R 1 plus j omega L 1 plus this one. So, look if we the due to a mainly when mutual coupling is not there M is equal to 0. So, these terms should not be there, it will be the only there you are what you call the impedance of the coil 1, but due to that you are what you call mutual inductance this term is added.

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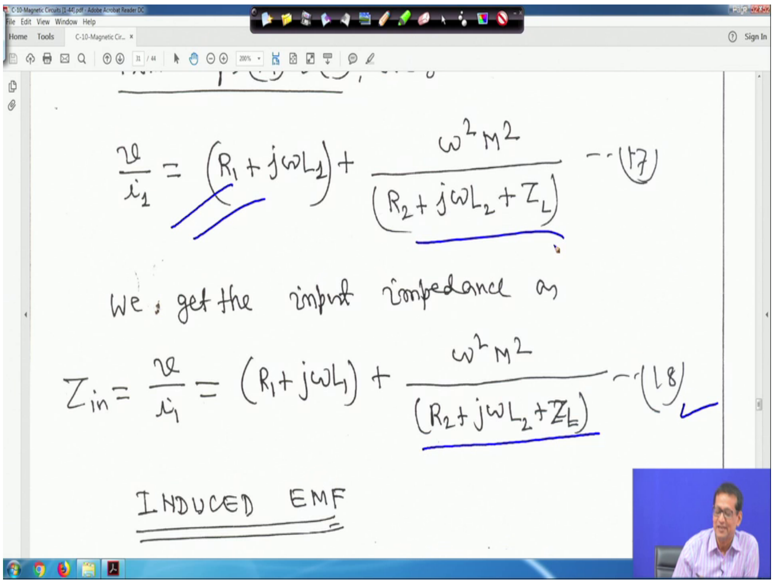

So, this is actually reflected impedance of your coil where is your this thing of the circuit that is omega square M square upon this one this is equation 18 right. This is simple thing only thing is that this one you solve and find it out I have written the final expression right.

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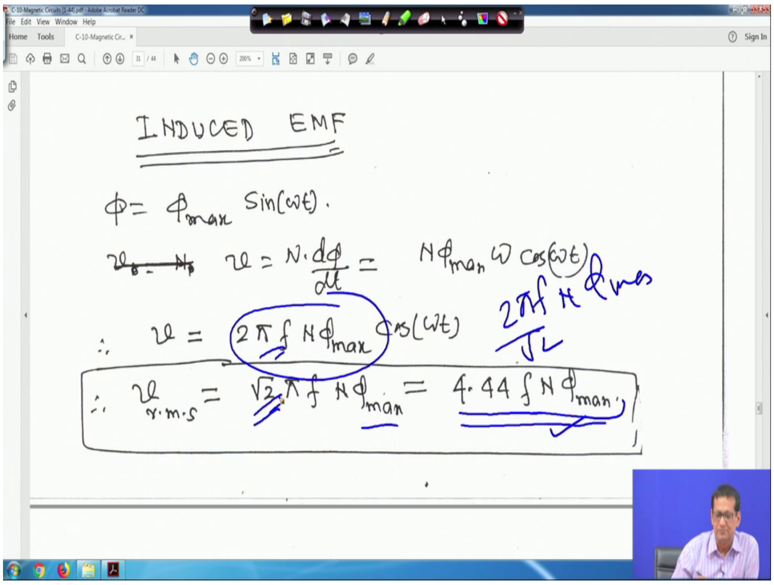

Now, next is induced EMF very simple thing suppose you take flux is sinusoidal one. So, time varying phi is equal to phi max sin omega t. So, V is equal to N d phi by d t if you take the derivative of this one, you will get N phi max omega cos omega t right and omega is equal to 2 pi f. So, v is equal to 2 pi f N phi max cos omega t right. And this one and this one this is the maximum voltage. So, divide this 1 by root 2, this is 2 pi f N phi max, divided by root 2. So, it will be now root 2 pi f N phi max this is 4.44 f N phi max. This is the RMS voltage a simple thing just for this thing I have written the phi is equal to flux is phi is equal to phi max sin omega t then, how the voltage will be induced and we know v is equal to, N d phi by d t in coil you have N number of tones and phi is the flux linkage.

So, this is your RMS value of the voltage 4.44 f N phi max right because this term is divided by root 2. So, it will be revived 2 by root 2 will be root 2 right.

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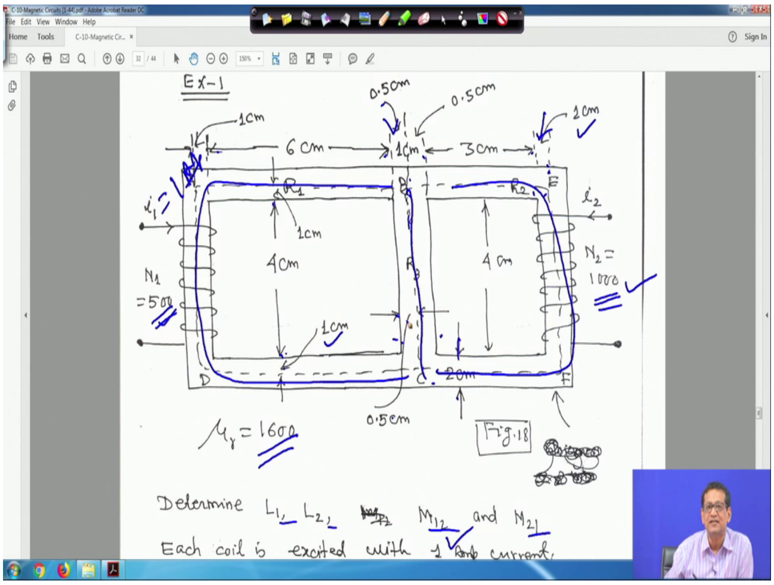

Next will take the numerical; numericals are easy only thing is calculations should be correct for example. This example one is taken right, just hold on let me reduce the zoom little bit right. So, this is the problem. So, in that case first you see the problem it is actually what is given that your you have to this is one your what you call this is coil is own on this on this part of this material right and number of turns N 1 is 500 and here also N 2 is N 2 is equal to 1000 turns right.

And you have to you have to consider the your mean path all the time in mu r for this one is given for this material is 1600 right it is given and you have to find out L 1, L 2, M 1 2 M 2 1 each coil is excited with 1 ampere current and each coil is excited with 1 ampere current will only considered for this one. And how to take the mean length how to take? The dimension is given this height from here to here it is given 4 centimeter from this point to this point it is given 6 centimeter and here the thickness is 1 centimeter.

So, from mean path we take. So, this is actually 0.5 centimeter this side also 0.5 centimeter this also it is given from here to here 3 centimeter from here to here it is 6 centimeter it is given right and side is actually your what you call sides are 3 into 3 centimeter each. So, your right sides are 3 centimeter each. So, and this 3 not 3 2 centimeter each right, it is 2 centimeter this is 2 centimeter right. So, mean path will be this side it will take from here it will be here to here it is 1 centimeter see carefully everything is marked.

And here also this is the 2 centimeter. So this, mean path will take. So, from here to here this gap is 1 centimeter right and here also 1 centimeter. So, we have to find out you have to what you call you have that three different path right three different path and this is from here is; one from here to here, another is here this limb and another is this limb right.

So, there are three paths right and say both we say either of this what coil is excited by 1 ampere current first we consider only i 1 is equal to 1 ampere forget about this one, the turns here it is 500 and turns here it is your 1000 turns. Independently will see how things are and here this is your thickness of this is 1 centimeter. So, that is why from here to here the mean path it is marked 0.5 centimeter right. So, everything is marked let me clear it if you look at the diagram everything is marked for you just see carefully how we have done it right. So, you have to find out.

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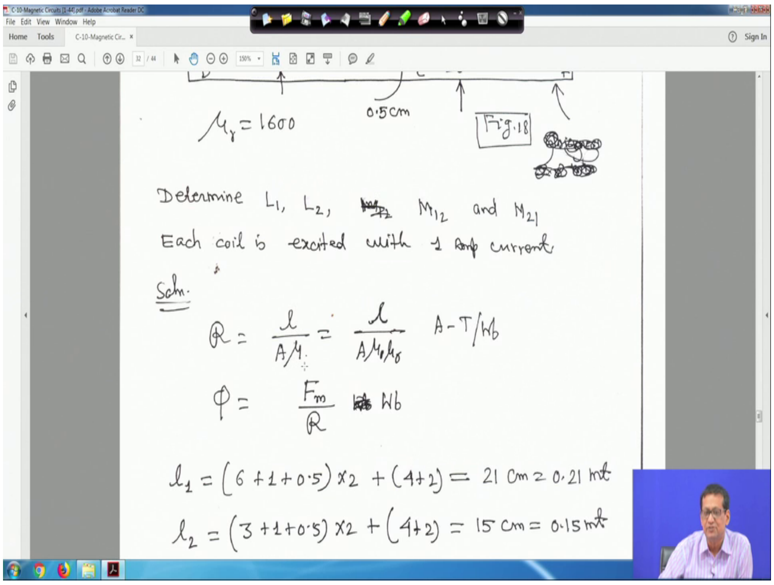

So, you have to find out this is figure 18, L 1, L 2, M 1 2, M 2 1 each coil is excited with 1 ampere current first will see that coil 1 is excited with 1 ampere current right.

So, now if you see that you are what you call that we know the reactance is equal to L upon A mu, that we know that is L upon A mu 0 mu r ampere turns. So, ever mu r is given 1600 for this for this materials same materials this 1600 right and we know phi is equal to F m by R like your V by R. I will find out similarly phi is equal to F m by R Weber now we have to there are three different path.

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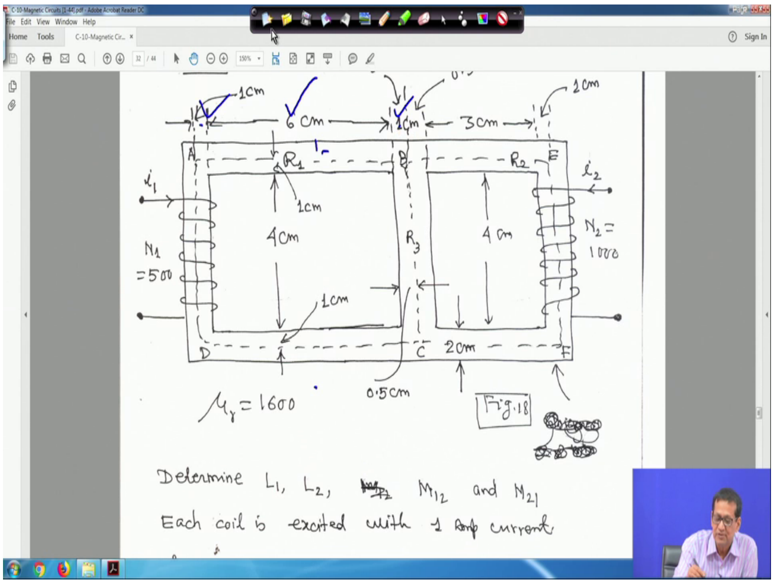

So, L 1 if you see that this is actually mean path. this is actually 6, this is 6 right and this side is 1 and this side is 1, this similarly this side and this side identical right, this side and this side identical and this side 4 plus 1 and your 4 plus your what to call from here to here, it is 1 you get here 1 right, this side it is there yours 4 your what you call this from here to here it is 6 and here it is 1, here it is 1 right. So, 6 plus 2 into your 2 so, if you look into this if you look into this sorry L1 is equal to 6 plus 1 plus 0.5 into 2 of this side is actually this is 6, this side is 1, this side actually it is 0.5 this gap is actually 0.5.

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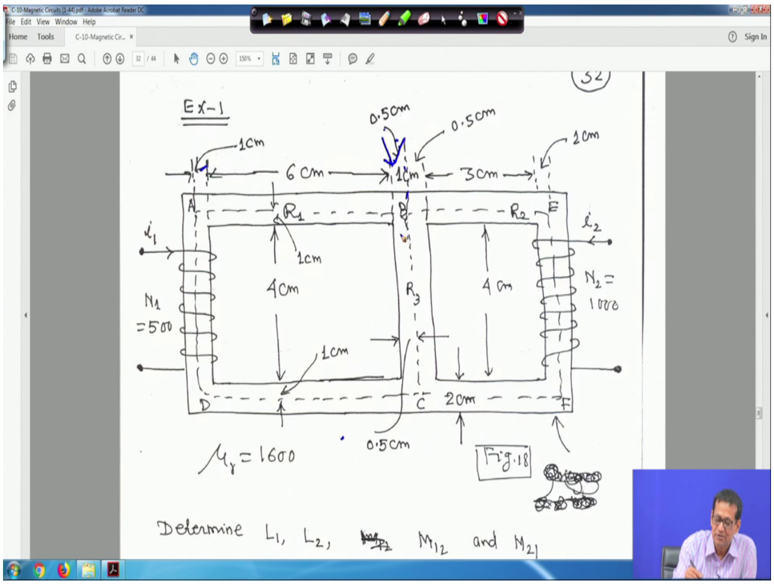

So, and same is the other side also it is 6 plus 1 plus 0.5 into 2 not 1 1 is total here it is 0.5 the mean path right. So, plus just see this. So, this is actually your into 2 plus 4 plus 2, where in this side this side this side it is 4 and this side is for your what you call this side it is 1 and this is also 1 so, 4 plus 2 so, this side actually 4 plus 2. So, this is actually 4 plus 2 is equal to 21 centimeter that is 0.21 meter. Similarly if you come for L 2 it is given 3 plus 1 plus prime 5 into 2 4 plus 2, that is here it is 3. This side is 1 look at that I am marking by pointer rather than plane 3 plus 1 this side is 0.5.

So, 3 plus 1 plus 0.5, this side also 3 plus 1 by 0.5 multiplied by 2 right then plus 4 this side is 1 because here it is mark 1.

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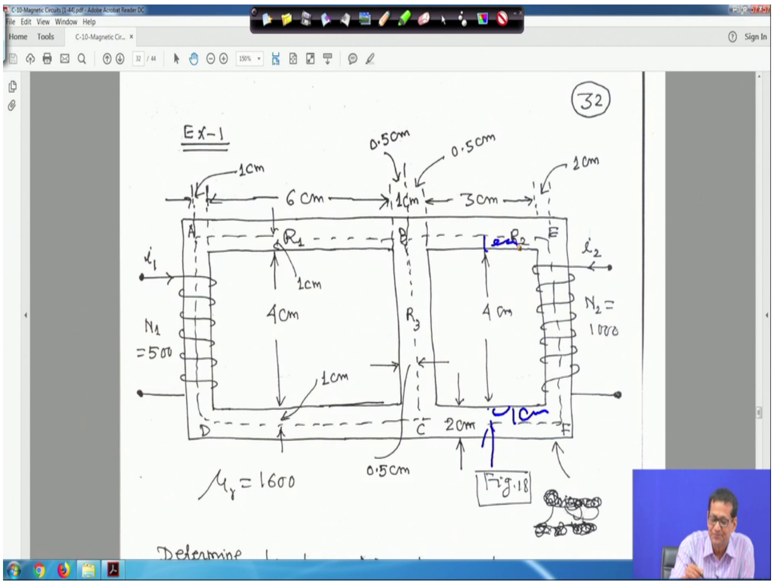

So, this side is 1 this side is 1, I mean I mean hear it is written 1. So, same is here also here also it is your what you call 1 centimeter. So, this side also 1 centimeter so, 4 plus 1 plus 1 right, so uniform it is uniform. So, so here it is your L 2 is equal to then it is 15 centimeter 0.15 meter now L 3 is the middle centre limb right, L 3 it is 4 plus 2, this side is 1, this side is 1, this is the height right and this R 1 this R 1 R 2 R 3 R1, here R 2 here this is the your reluctance of the three different portion right.

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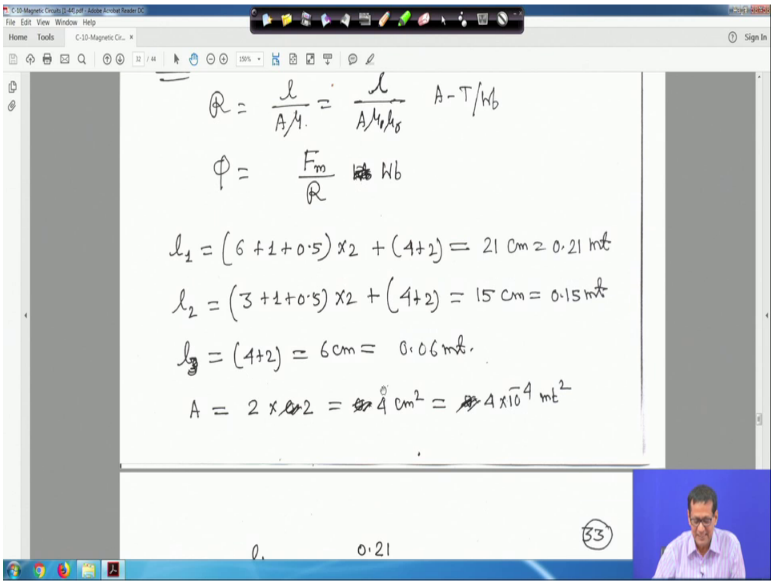

So, now L 3 is equal to just 4 plus 2 6 centimeter 0.06 meter and A is equal to sides 2 centimeter each so, 2 into t 4 2 into 2 4 centimeter square that is 4 into 10 to the power minus 4 meter square.

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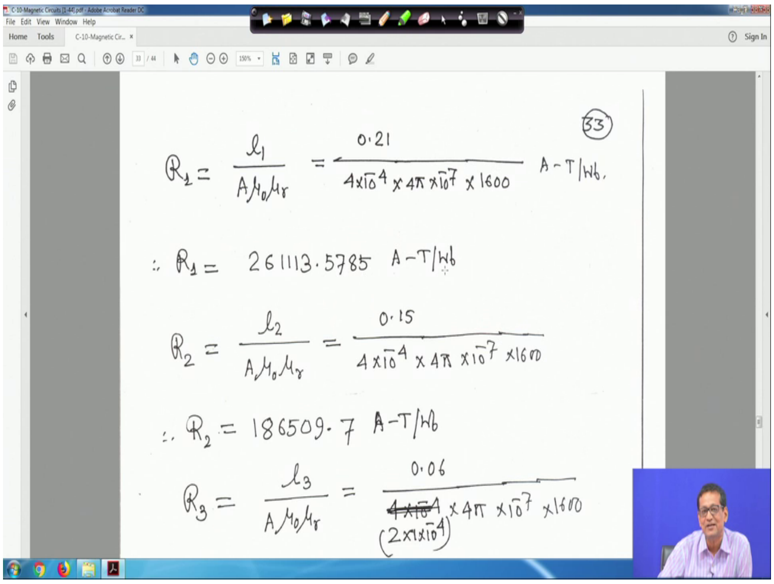

Therefore, reluctance for path 1, R 1 is equal to L 1 upon A mu 0 mu r mu r is given right and A is also known. So, is substitute you will get this is the value of R 1 26000 not 26000 it is your what you call 261113.5785 ampere turns per Weber right.

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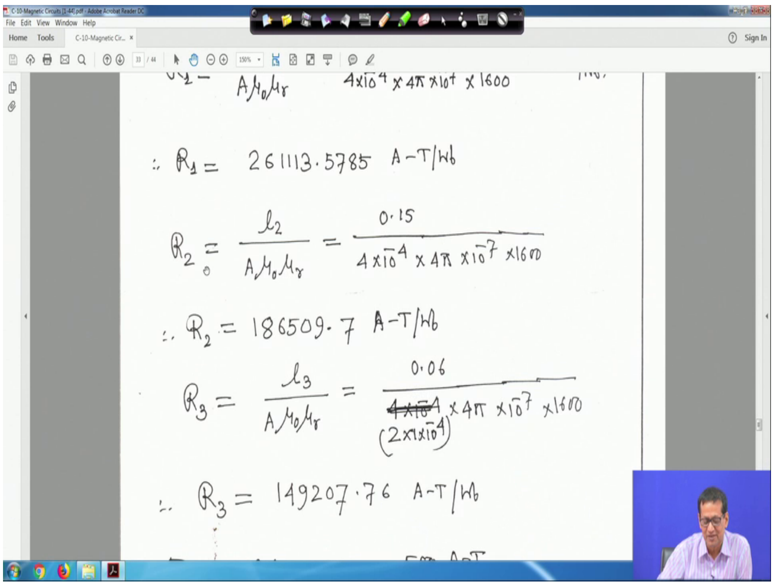

Similarly, for R 2 if you calculate reactance for path 2, this is for path 1; that means, this path right that reactance of this path 1 is for this path it is marked as like this.

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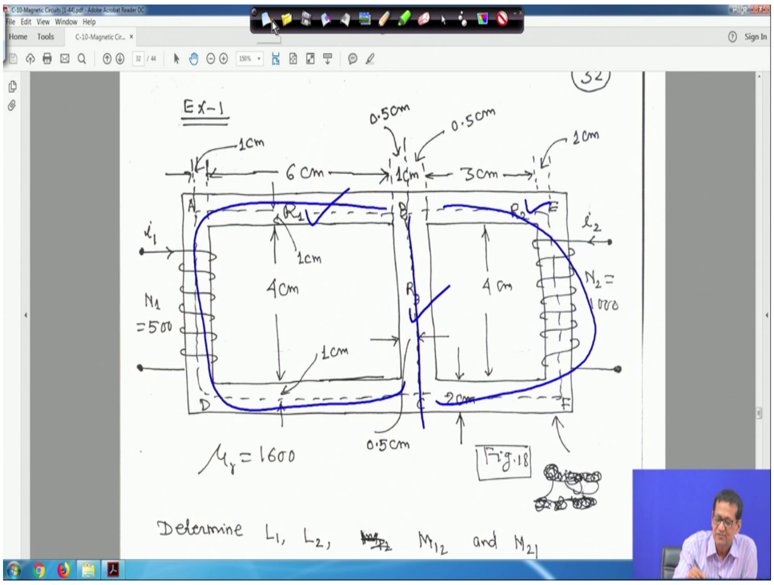

It is this is for this path you are getting reactance of this is another reactance, this is another reluctance, this is for R 1, this is R 2 and this is R 3, 3 different path right centrally and other two sides.

So, here similarly for R 2 you calculate L 2 upon A mu 0 mu r, all are computer substitute you will get 186509.7 ampere turns per Weber similarly for R 3, you will get you will get 149207.76 ampere turns per Weber.

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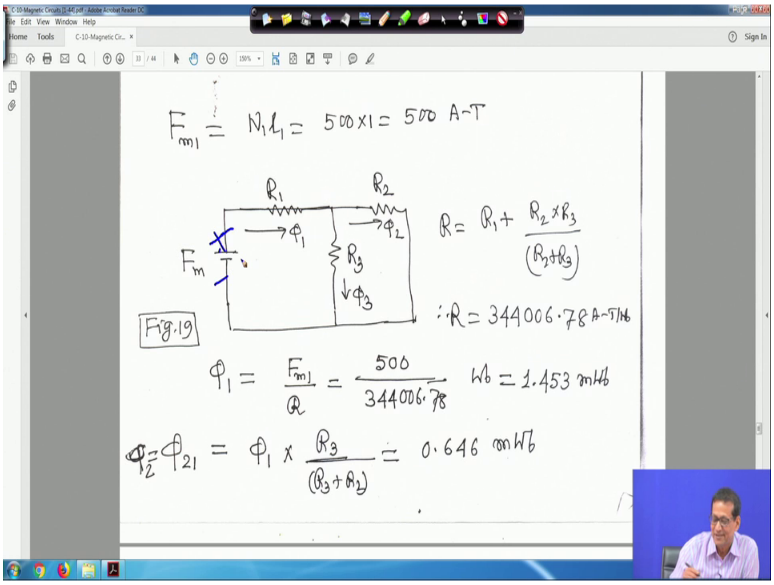

And we know that m 1 F for your for that you coil 1 is excited by 1 ampere current and it is turns is 500 we are not considering coil i 2 right just 1.

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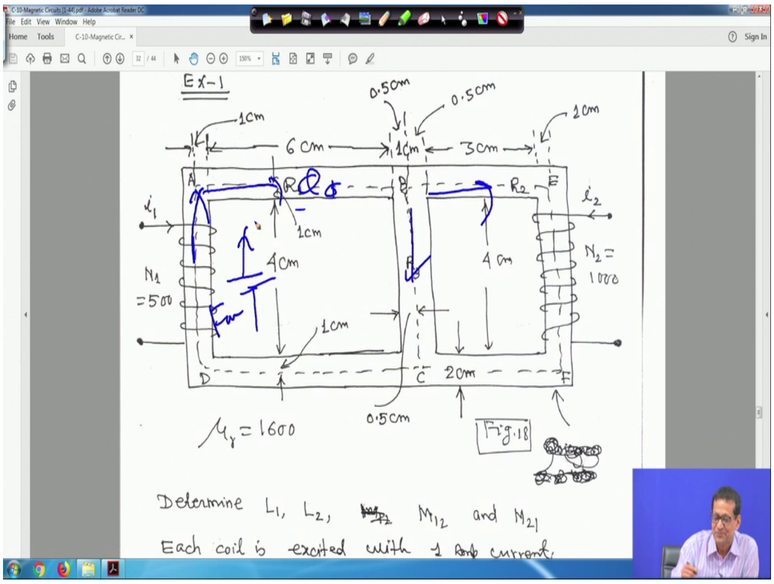

So, f M 1 is equal to 500 ampere turns now it will look into that that this is your circuit like a DC circuit for example, that this is the direction of the flux this is your direction of the flux because you wrap grabs the coil in the direction of the current then thumb is the direction of the flux.

So, this is the direction of the flux right, say total flux if it is phi 1 right phi path is going here and path is going like your DC circuit and this is your flux is flowing right the current flows and the direction of the flux is this way; that means, this will be plus and this will be minus and that will be your F m this will do that is a you see the direction of the flux and from flux where your current actually coming out. So, flux is coming out this way you take this is analogous analogy to electric circuit right. So, if you if it is. So, when you look at the circuit look at the things are very simple once you have calculated look at that this is phi 1, this is phi 2 and this is the phi 3, that the this is the flux and this flux is divided into 2 this 2 are parallel path right.

So, at this is your F m 1 this is plus minus sign I told you, I will take you graph the you grabs the conductor in the direction of the current the thumb will be the direction of the flux. So, accordingly you can choose the polarity this is your this is your this is your polarity, this is plus minus this way you take right and same as resistance you simply, calculate the series parallel this thing.

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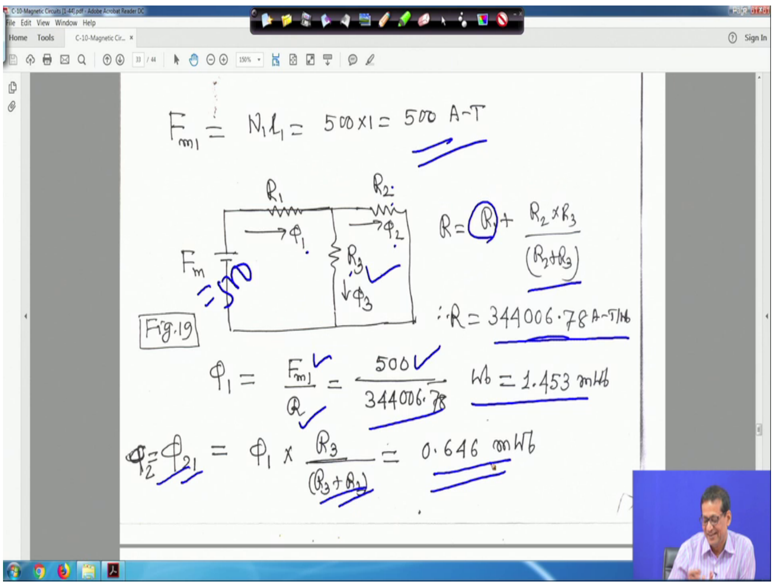

So, it is reactance. So, will be equimately R 1 plus this two are in parallel, R 2 into R 3 by R 2 plus R 3 with that you will get the reluctance of the complete your what you call complete circuit right, this is ampere tones per Weber therefore, phi 1 that is the current i 1, you will get f m 1 by reluctance. So, phi f m f m is equal to your 500 ampere turns that you have calculated here it is, 500 ampere turns. So, divided by this figure that is getting 1.453 milliweber, this is your phi 1 right.

Now, the way we do the current division same way the phi 2 actually phi 2 1 right, phi 2 is equal to this one it is phi 2 1 is equal to you can write the phi 1, this is the total flux into R 3 divided by R 3 plus R 2 the current division diode and here also flux division. So, it will be 0.646 milliweber, very simple it is only you have to understand little bit right nothing is there, looking at the diagram circuit nothing is there just see the direction of the flux see the ampere turns and calculate all the reluctances value dimensions correctly right and then you will get your what you call the correct answer right nothing is there actually right.

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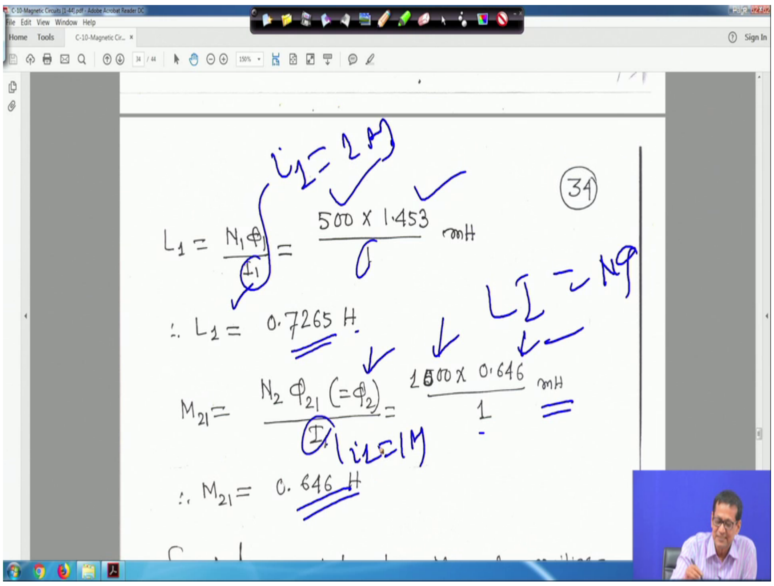

So, this is your what you call phi 2 1 now, we know that earlier I told you know this relation is required that L I is equal to N phi. So, same relation we are using L 1 is equal to N 1 phi 1 upon i 1. So, N 1 is 500 right, phi 1 will got 1.453 milliweber and current I 1 actually this one in the diagram it is showing i 1 small i 1, it is actually 1 ampere not capital I 1 so, correction right. So, it will be 0.7265 Henry that is L 1 and M 2 1 is equal to your N 2 into phi 2 1 that is equal to actually phi 2, because in the other coil there is no current i 2 is equal to 0 right. So, we are trying to find out M 2 1 divided by I 1, it will be small I 1 it is actually 1 ampere right.

So, N 2 is 1000 ampere in the second coil and phi 2 1 is 0.646 your milliweber divided by 1 ampere. So, it is millihenry. So, 0.646 millihenry so, very simple it is right.

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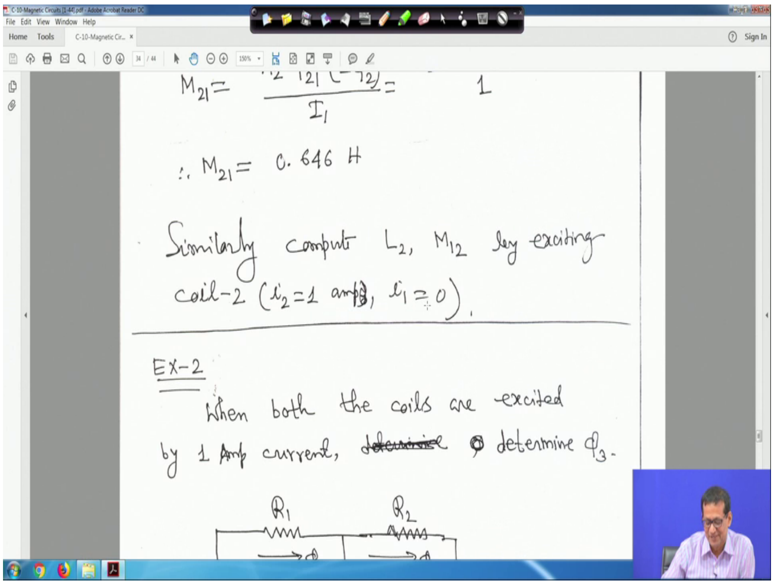

So, similarly you should compute this one L 2 M 1 2 by exciting coil 2 i 2 is equal to 1 ampere and take i 1 is equal to 0, this you please do it of your own right, answers are not given.

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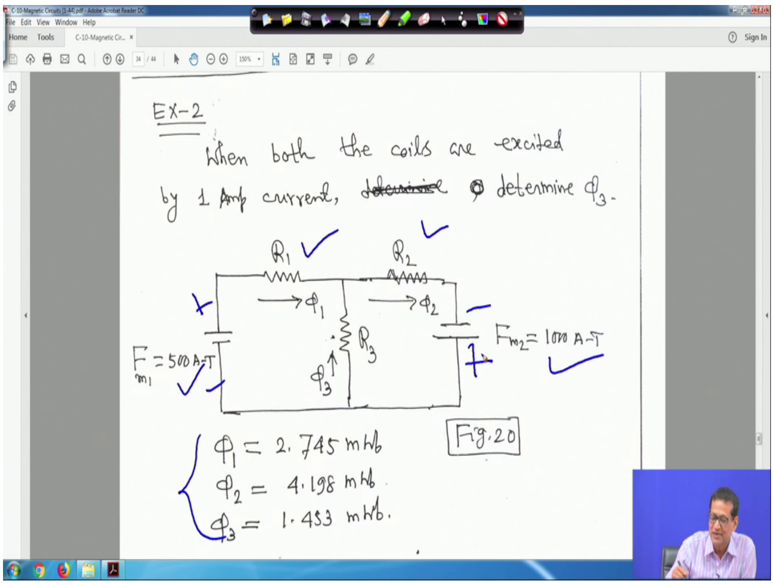

Example 2 when both the coils are excited by 1 ampere current; determine phi 3 right so, question is that the both the coils are excited in that case, look here is plus minus here it is actually if you look into that here it is plus minus, but here it is plus minus, but 1 ampere current both the coils are excited.

So, this is 5 ampere ton this is 1000 into 1. So, 1000 ampere ton this is R 1 R 2 R 3, this way you have to compute phi 1 phi 2 phi 3, then look at this one this is plus, this is minus right like you please come to that diagram, when both the coils are excited.

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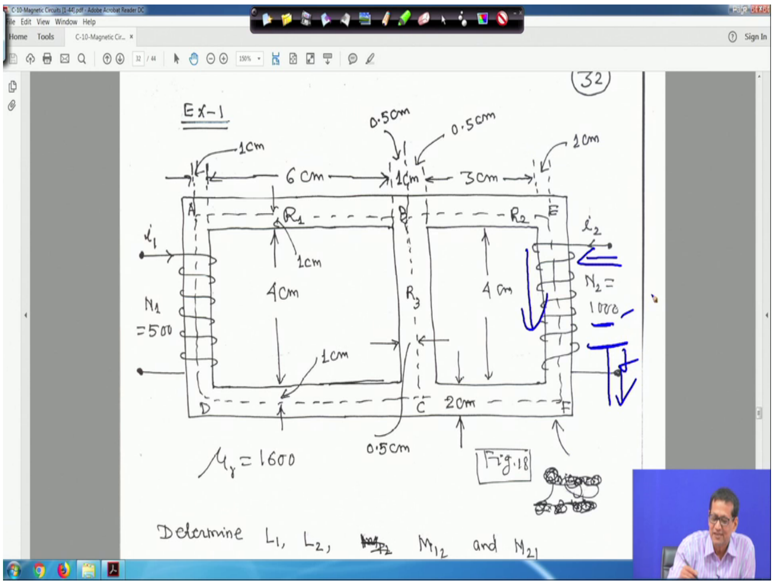

When the both the coils are excited right in that case look this is the direction of the current this is the current right by right hand you graph the conductor in the direction of your what you call in the direction of the current i 2 in here right you graph it like this. So, thumb it moving downwards I mean this is the flux line. So, this is your flux your phi 2 right.

So, as it is downward means this is plus and this is minus, as if the way current comes out for the positive terminal here also the flux direction that is why this is plus this is minus that is why, that is why in the diagram that is why in this diagram, you are taken this one everything I have given to you. So, these are the answer phi 1 phi 2 phi 3, this one the answer you please all the reluctants everything computed. So, please solve it for yourself answers are given for this one right.

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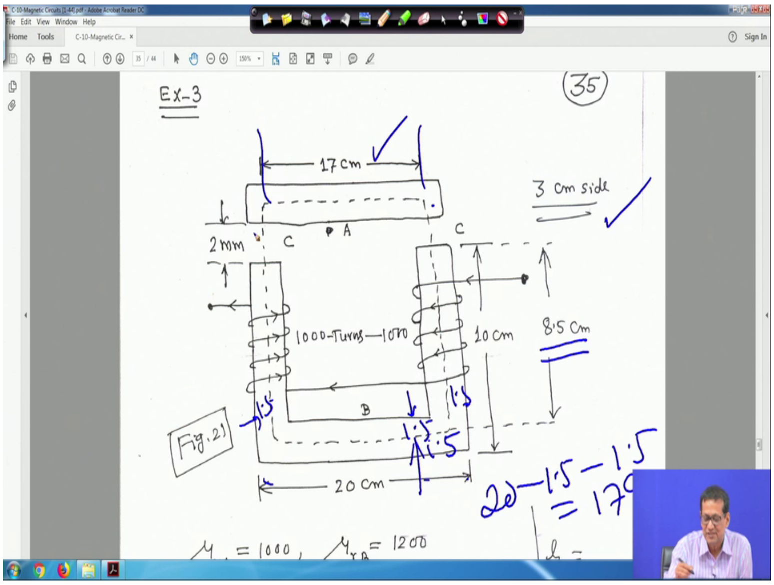

Now example 3, this is also one, where here is 1, 1 limb is there this is 17 centimeters right, this is 2 millimeter, this gap is 2 millimeter and 1 coin is there it is own, like this there both the coils this side 1000 turns this side is 1000 turns, here it is from here to here the length is given 10 centimeter.

So, you have to your what you call you have to see the mean length. So, this is from here to here 20 centimeter and this 3 centimeter side, it 3 centimeter side means that is; that means, 3 centimeter side means this mean length; that means, this is actually this portion actually 1.5 this is also 1.5. So, 10 minus 1.5 so, 8.5 this is the mid length, that is mean height right, 8.5 and this is 20, but see here what we call it is your 3 centimeter side it is written here, 3 centimeter side with this side 1.5 and this side also 1.5; that means, mean length will be this side from here to here 20 minus 1.5, minus 1.5 that is equal to 17 centimeter right and this is already mean length is given. So, everything is computed gap is 2 right and this is your; what you call we are what we call we have to find out fraction other thing.

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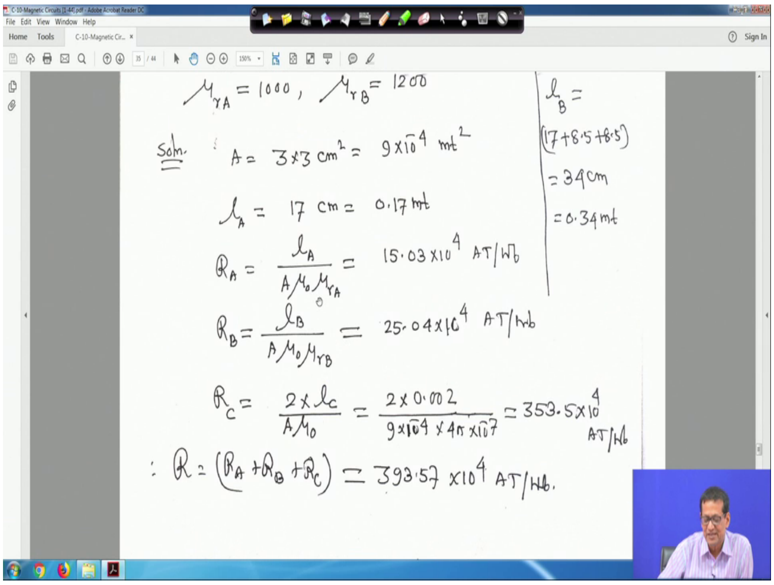

So, if you look into this and look into this that your there are three paths when L B then your L C and this is L A, this is look at the pointer this is L A the gap is your L C and here it is this path is L B right, it is mark B it is A and this gas here it is mark C, look at the pointer right. Therefore, mu r A is given 1000 for your for this material and mu r is 1200 for this material right. So, A is equal to 3 centimeter side so, it is 9 into 10 to the power minus 4 meter square right. L A is equal to 17 meter centimeter that is 0.17 meter L B is equal to your this is I told you this 17 plus 8.5 plus this side also 8.5.

So, 17 plus 8.5 plus 8.5 centimeter is equal to 0.34 meter. So, reluctance formula L A upon A mu 0 mu r A so, you will get this value similarly R B is equal to L B upon A mu 0 mu R B substitute all the values right, mu 0 you know 4 pi into 10 to the power minus 7, you substitute all you will get these value and R C will get 2 L C upon a mu 0 right, that is your what will get that is your whatever it comes that 2 millimeter. So, 0.002 meter divided by this one right. So, is equal to you will get your this thing. So, why R C is equal to 2 is taken this side 1 gap, this side also 1 gap, that is why it is multiplied by 2 into right this is 2 millimeter gap here also 2 millimeter gap.

So, that is why 2 into L C. So, it is your what you will call this much value is coming. So, total m m f will be coils excited by 1000 1 ampere current. So, this side your, what you call 1000 turn, this is 1000 turn and excited by 1 ampere current right.

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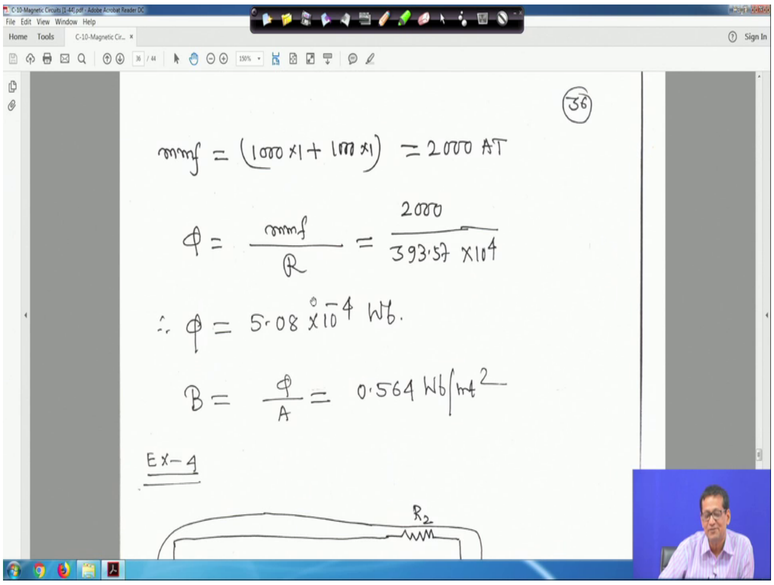

So, in this case it is your 2000 ampere turns. So, phi is equal to m m f by reluctance total reluctance will got this one. So, phi is equal to m m f by reluctance is equal to this much of Weber and flux density B is equal to phi by A. So, this is phi cross sectional area is 9 into 10 to the power minus 4 meter square.

So, this is 0.564 Weber per meter square right, hope you have understood this right there is absolutely no problem, take some problem from the same book and please do it yourself some problem, take some good book and see that you are solving it.

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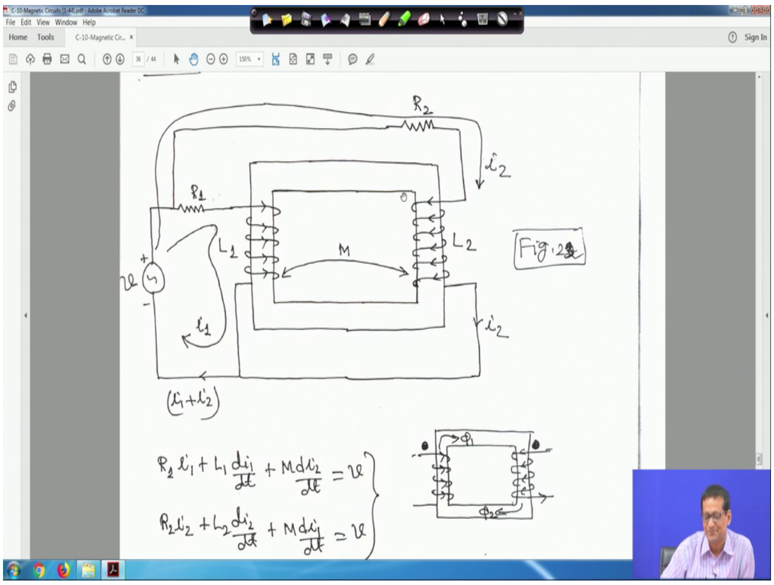

Similarly this one I will not tell you anything this I leave it to you a circuit is shown right that you are that is coil here you have N number of turns a N 1 number of turns, N 2 number of turns mutual dot nothing is shown something you put, I am aided something and all this equal two equations I have written right. So, you check whether it is correct or not this is everything is correct, but you check this is given to you right. Look at that, sometimes you should not be confused looking is such kind of electrical, such kind of circuit see carefully how this is connected and accordingly you will do it.

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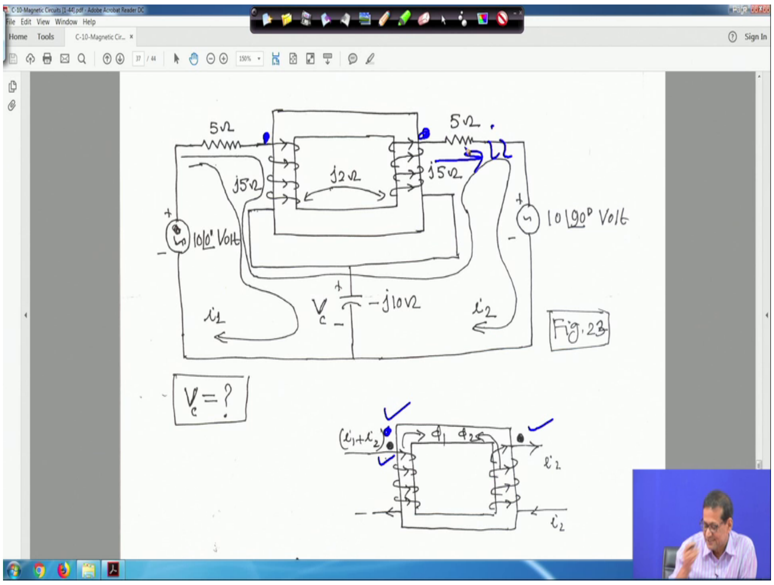

Now, example 5 there this problem I have taken from one book. So, this problem, I mean you have to see how things are right. So, all these things actually this your direction of the current was not marked in the book this I have made it and this say this is 5 ohm and your self area reactance you have reactance is also 5 ohm and here also 5 ohm here also reactance 5 ohm mutual reactance is j 2 ohm, it is given and here voltage is given 10 angle 0 degree, here it is given 10 angle 90 degree volt, 12 it is not one capacitor is there capacitor reactance is minus j 10 ohm, you have to find out voltage across the capacitor that is V c is how much? That you suppose you have to compute and this way I have taken that loops are this thing the way I have taken this is one is i 1 and this is one is like taken i 2 right.

So, if you take like this then i 1 plus i 2 flowing through this right, because you have taken like this. So, if you now this is actually what dots and other things not mentioned.

So, here dot convention is taken right. So, current is entering here is dot is taken right and in this case you are what you call another dot is taken here another dot is taken here right, say current is your what you call leaving and here it is taken that current is entering this 2 dots we have taken. So, this dot thing is taken right. So, this way I mean this; that means, i 1 plus i 2 current entering into the dot and this i 2 current actually it is your this is the current i 2 we have taken like this.

So, this is actually i 2 this is taken like this right suppose it is leaving the dot.

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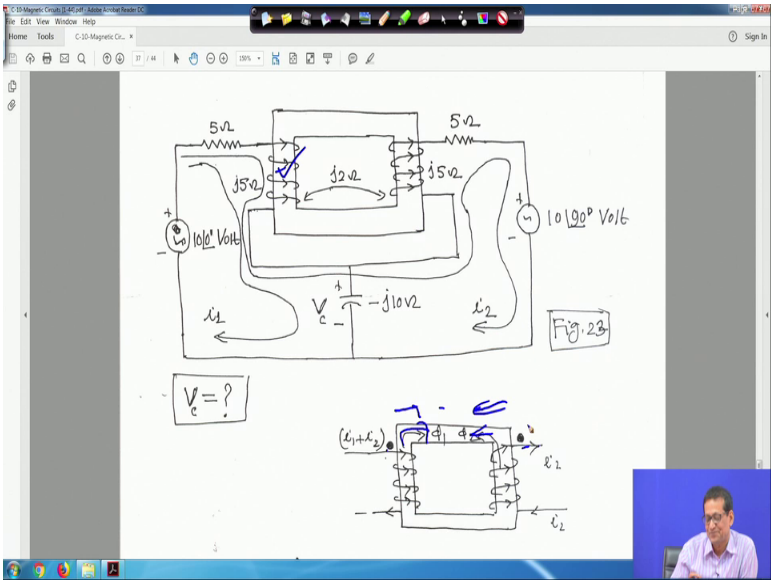

So, if it is so then look at the flux direction. Now, in the direction of the flux for this winding for this winding i 1 plus i 2 entering, so it direction of the flux that if you put there it is it is actually going like this, this is phi 1 and in this case now in this case what is happening, that current is leaving the dot right as the current is leaving the dot that in the direction of the current if I wrap it the way on the left hand side, right hand side, if I wrap or grabs the coil like this the direction of flux is upward that is why phi 2 is upward.

So, phi 1 this way then phi 2 is this way that is there, opposing each other is not it; that means, your when you write the equation it is entering the dot it is leaving the dot that mutual thing will be negative sign right.

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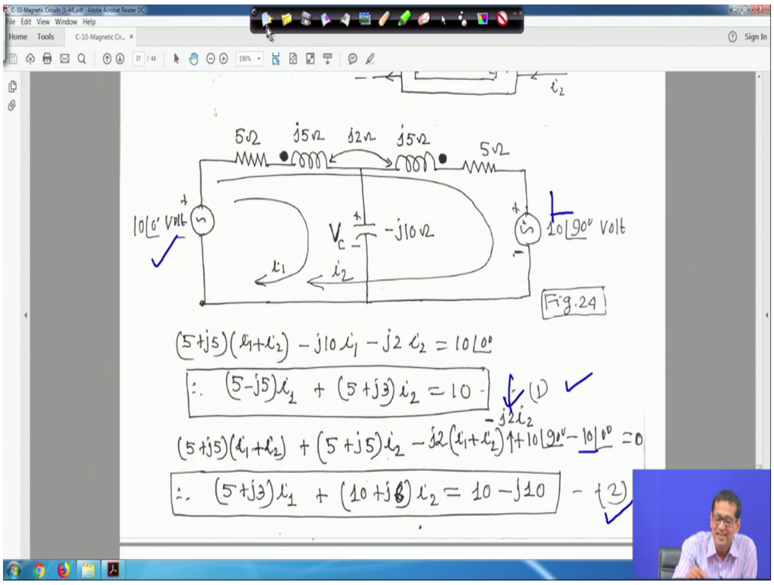

So, if you write the equation look it takes time. So, this is the equivalent circuit right, this 10 volt, this thing 5 ohm j 5 ohm, this mutual inductance between, this one is entering the dot in the coil another is leaving the dot and this is 5 ohm. Now you can solve it by putting this thing because 2 coils are there right. So, repetition will be there is not it.

So, but question is put the put the KVL in the first equation it will be, 5 plus j 5 into i 1 plus i 2, because here this is that your i 2 and this is the i 1. So, current flowing through this actually look at the pointer it is, i 1 plus i 2. So, 5 plus j 5 into i 1 plus i 2, now minus your mutual will come later minus, this is j 10 reactance into your i 1, because current in this loop. So, this is minus j 10 minus j 10 into i 1 right, then at current your what you call even entering the dot and i 1 plus i 2 entering the dot i 2 is leaving the dot. So, it will be for this loop it will be minus j 2 into your i 2 right, because in this coil voltage induced due to i 2, it will be minus j 2 into i 2 that is 10 angle 0 right.

So, this is the voltage 10 exist this is one equation, similarly for your second one, when you apply your what you call now this is the second your what you call this is the second loop and you are covering like this. So, in that case both the coils say this current your, i 1 plus i 2 flowing through this and i 2 is flowing through this. So, look how things are it will be 5 plus j 5 i 1 plus i 2 right, then here if you will come it will be 5 plus j 5 i 2 right; this voltage will come later. Now let us consider the mutual inductance, now it will be this coil in this coil voltage will be induced due to i 1 plus i 2, but it is by entering the dot leaving the dot. So, minus sign so, minus j 2 mutual your reactance is j 2 minus j 2 into i 1 plus i 2.

Now, next is voltage induced your what you call in this coil due to the current here i 2 will be minus j 2 look at the arrow here it is upward, I have made it your what you call minus j 2 into i 2 right here, it is minus then minus j 2 into i 2, then plus 10, 90 degree angle, 90 degree minus 10 angle 0 degree. So, this is equation 2, this is equation 1 you solve for i 1 and i 2 right, I hope you have understood this right, I hope you have understood this I mean if you understood, if you have understand this understood this problem then absolutely there is no problem for solving any other problem in magnetic circuit right just you have to see the dot convention.

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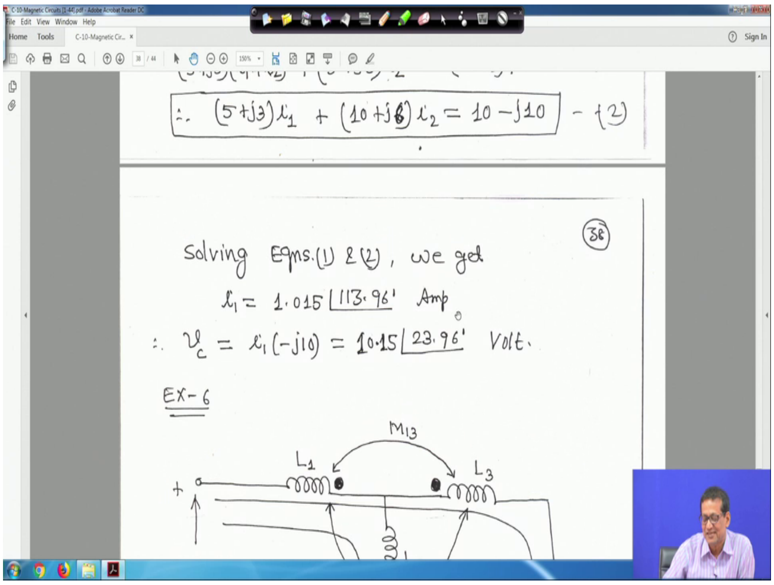

So, in this case so, if you solve for equation 1 and 2. You will get i 1 is equal to 1.015 angle, 113.96 degree ampere. Look whole solutions I have, but here I did not put it will consume more time, this is an exercise for you please do it right.

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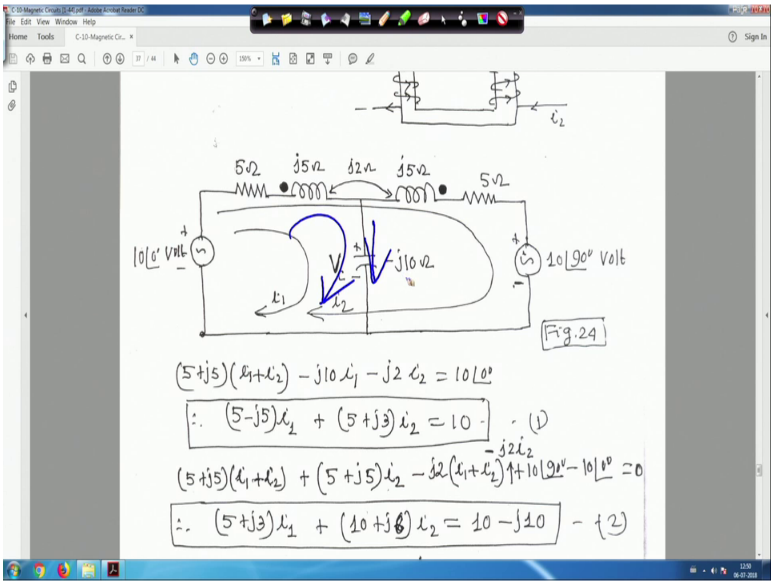

It will take some time to do it right and then V c will be this is the current, this current i 1 is i 1 is flowing through this is the current i 1 is flowing through this V c will be this your i 1 into minus j 10 right, that is what is written here this is i 1 into minus j 10. So, it is i 1 is 113.96 degree and minus j 10 means, it is your 1.015 113.96 into 10 angle minus 90 degree.

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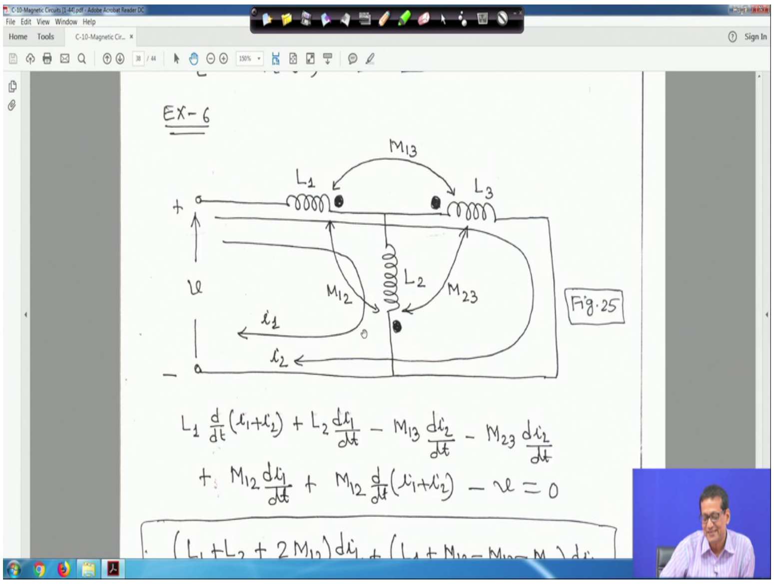

So, minus 90 plus 113.96 so, it will be your 10.15 angle 23.96 degree volt right this is this is the answer. Now this one, when 3 dots are 3 dots let me tell you one thing for the exam purpose, 3 dots are little bit heavy because of time consumption right. So, question is that, but this 3 dots are there this all this equations, I have written right you please write it I am not explain it. Now all are correct it will save my time.

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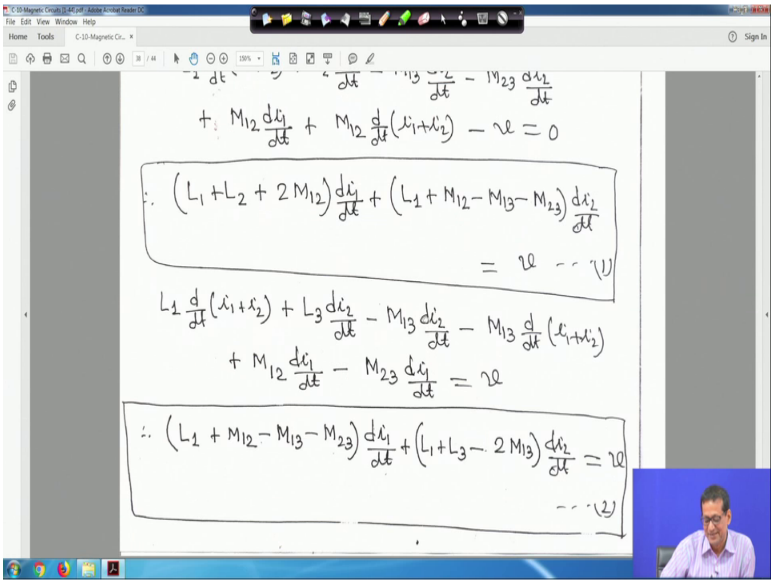

So, see how are you at least you will learn that, how I have written this all mutual things are given, they are cyclic current is given, the way I have taken right and just see this all this equations, I have written for you just see the circuit draw the circuit first, then you see the equations how I have written right and see all these things all these things written everything is actually correct.

So, please write yourself first, then you see this then you see what have been written then some time will be save right.

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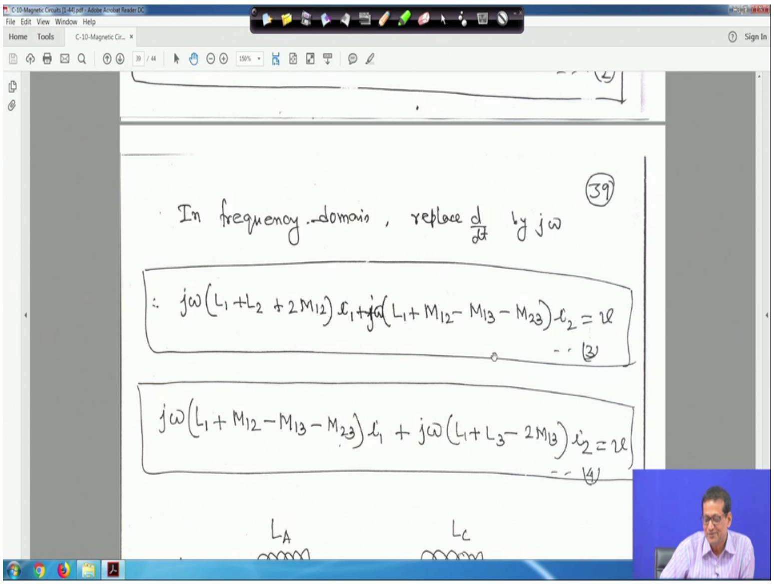

And in the frequency domain, I told you earlier d by d t, you replace by j omega right if you do. So, your equation will be like this right.

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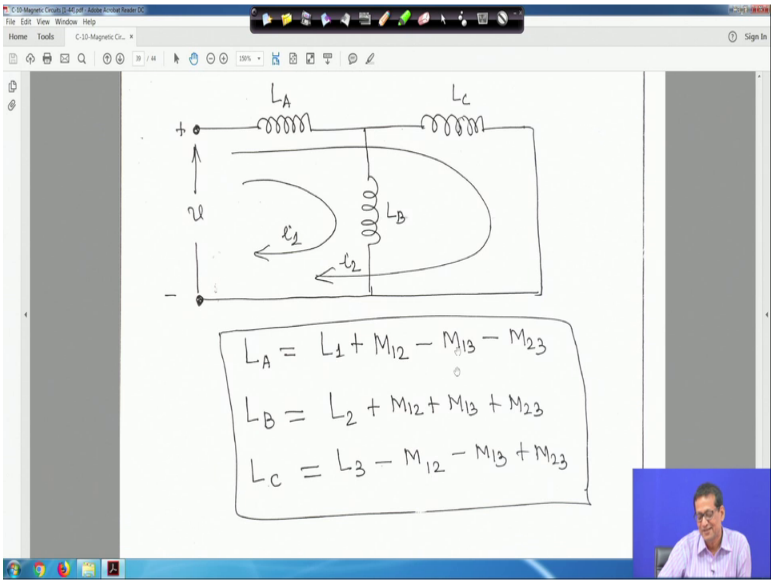

All these equations will be like this and your and ultimately your equivalent circuit will be like this right. So, this one you please make it of your own right, you write down all these equations of your own first you draw the circuit, then you right down all this your you pause it and then draw the circuit, then all this equations you write one by one alright and then you frequency domain you d d t you replace by j omega and then you will your what you call, then you see this one equivalent 1, this is either exercise for you or everything is given in front of you right.

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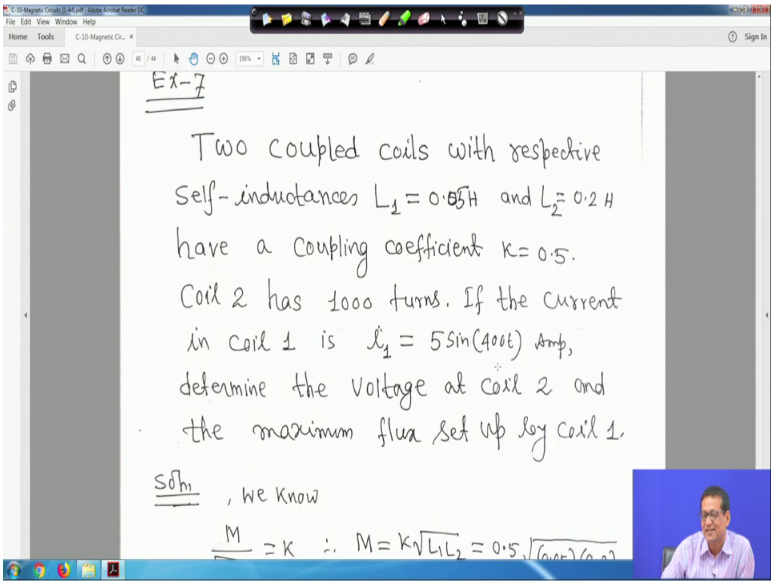

Next is this is another problem this is this problem is very interesting problem, 2 coupled coils with respective self inductances L 1 is 0.05 Henry and L 2 is equal to 0.2 Henry right, have a coupling coefficient K is equal to 0.5, coil 2 has 1000 turns, if the current in coil 1 is i 1 is given 5 sin 400 t that is omega is equal to 400 right, ampere determine the voltage at coil 2 and the maximum flux setup by coil 1.

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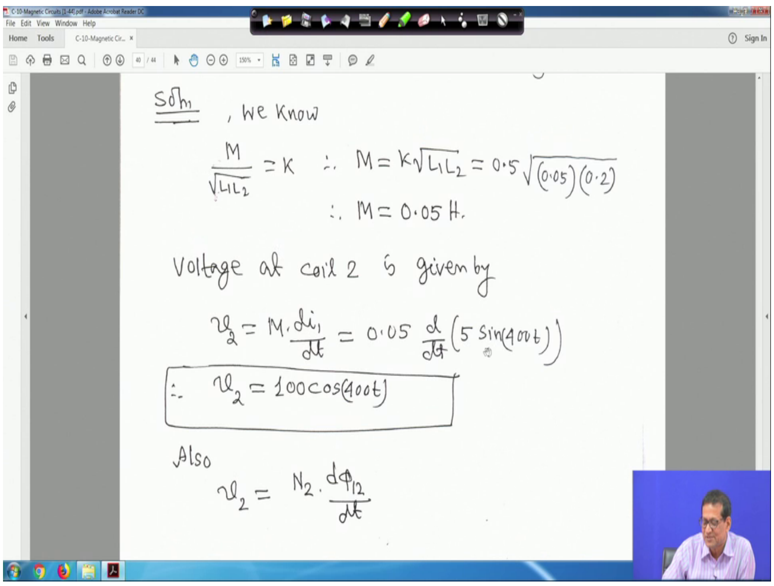

So, solution we know that K is equal to M by root over L 1 L 2 right, that is A or M by root over L 1 L 2 K. So, M is equal to K into root over L 1 L 2.

So, K is given 0.5 and your L 1 L 2 given root over 0.05 into 0.2 root over into 0.2. So, M will become mutual inductance will become 0.05 Henry. Now voltage of coil 2 is given by, we know that in coil 2 M into d i 1 upon d t. So, M is 0.5, where i 1 is given 5 sin 400 t. So, if you take the derivative V 2 will become 100 cosine 400 t right. So; that means, also V 2, you know is equal to N 2 d phi 1 2 upon d t that we know, but we have got it V 2 is equal to 1000 cos 400 over t right.

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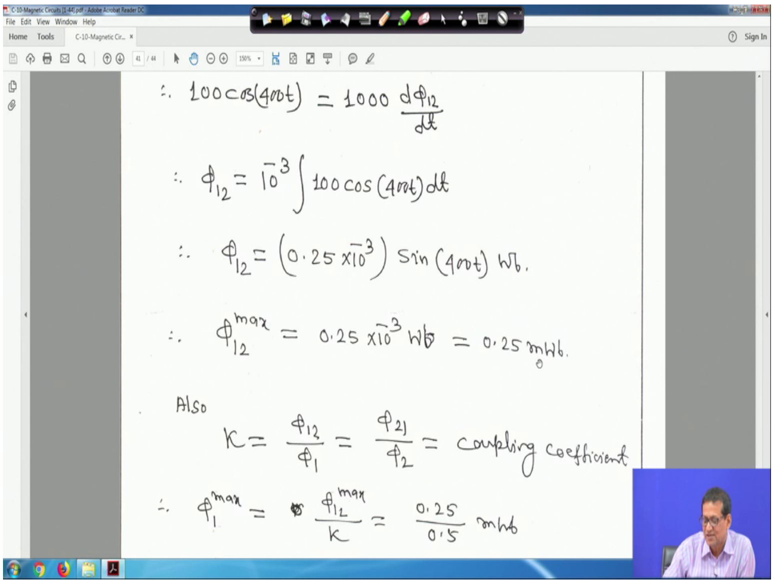

So now, in this case v 2 you substitute here N 2 is known and you have to integrate. So, 100 cos 400 t N 2 is 1000 turns, it is given d phi 1 2 upon d t or phi 1 2 is equal to your divided by your what you call 1000. So, 10 to the power minus 3 into 100 cos 400 t d t, if you integrate this phi 1 2 will be 0.25 into 10 to the power minus 3 sin 400 t Weber right.

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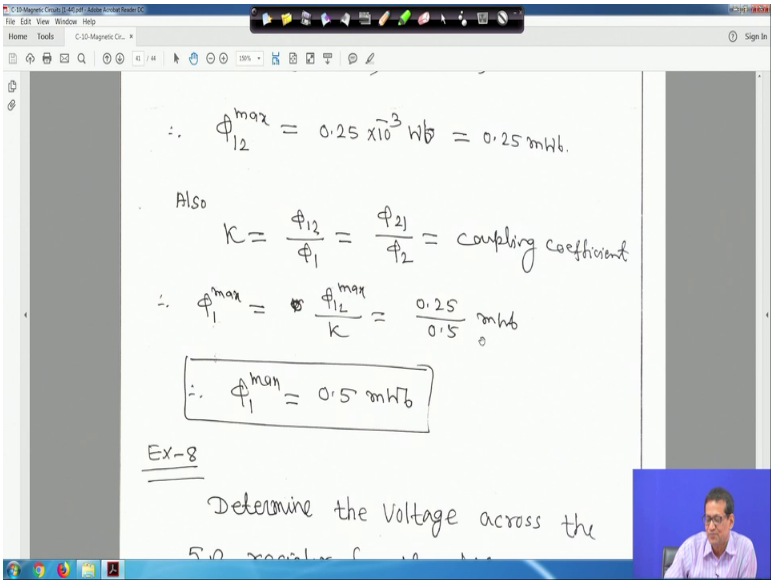

So, that the phi max will be 0.25 into 10 to the power minus 3 Weber, this is the phi max 0.25 milliweber right. So is; that means, K is equal to you know that phi 1 2 upon phi 1, phi 1 is the total flux and phi 1 2 is the flux linking the other coil. So, K actually is equal to phi 1 2 upon phi 1 or is equal to phi 2 1 phi 2, that is phi 2 the total flux and your flux 1, your phi 2 1 is the in coil 1 the phi 2 1 is the flux linkage.

So, either you can write K is equal to phi 1 2 upon phi 1 or phi 2 1 phi 2, this is also coupling coefficient, this you should know the slide we have seen earlier in the diagram right, phi 1 is equal to phi 1 1 plus phi 1 2 right; that means, K is equal to phi 1 2 upon phi 1 or vice versa or you can put that same philosophy or you can put phi 1 max is equal to phi 1 2 max upon K, from here you can from this equation you can write phi 1 is equal to phi 1 2, upon K or you can write phi 1 max is equal to phi 1 2 max upon K same thing you will get 0.25 by 0.5 you have miilliweber.

So, K is equal to 0.5 therefore, phi 1 max is equal to 0.5 milliweber right. So, this problem is interesting problem and very simple problem.

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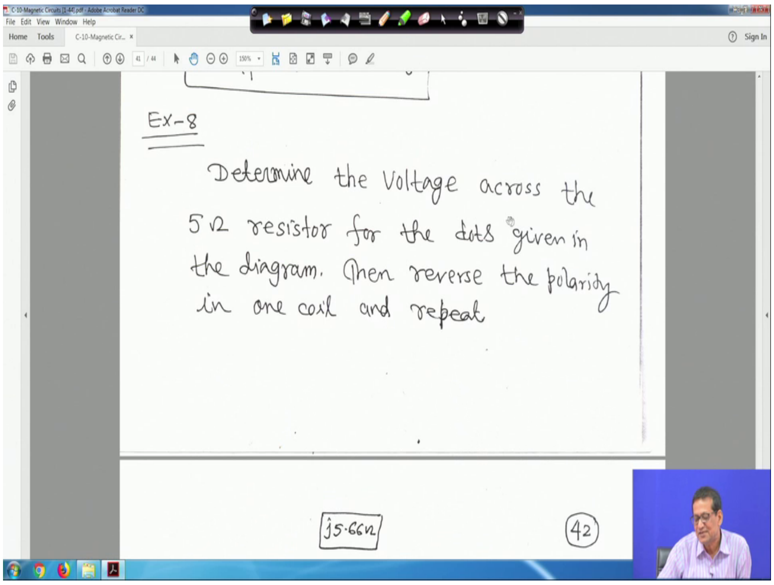

So, now this one determine the voltage across the 5 ohm resister for the dots given in the diagram, then reverse the polarity in 1 coil and repeat. So, this is the problem is given.

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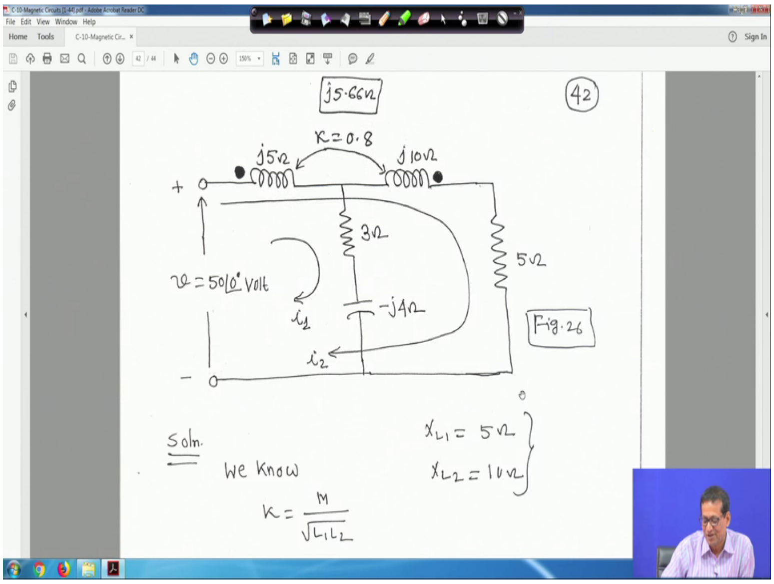

This is the problem is given that your K is equal to coupling coefficient 0.88, j is equal to given everything is given right. So, this whole solution is there whole solution is there I am not telling all this things.

So, it has you have been asked to find out the voltage across the 5 ohm resistance right. So, all this your X L 1 5 ohm X L 2 5 ohm, let K is equal to computed M by root over L 1 L 2 right everything is given right.

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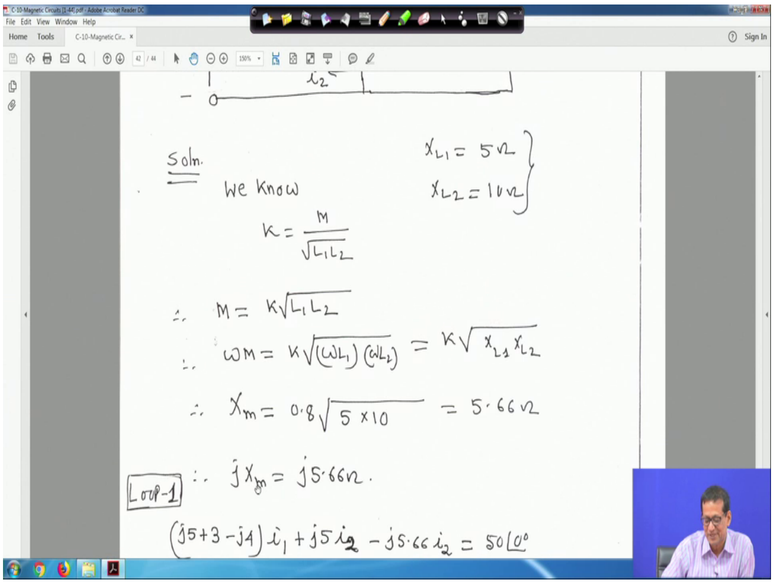

So, omega M then K up to up to this thing I am showing you this is computer right rest is you please solve it right I suggest you please solve it dot convention is given, the current is entering the dot leaving the dot; that means, when you write that your what you call the similar problem also shown you earlier right similar problem. So, when you talking when you are considering for ith second this loop bigger one, when you considering the whole one at the time see the repetition will be there for the mutual induce mutual voltage right.

So, you please solve it answers I am not telling you solve it, when you read this video lecture you solve it and you are what you call and at the time you ask the answer whether you have got the correct answer or not will. I will give you the correct answer, but put everything in the forum. So, now, magnetic circuit is over, now my question is that when you will come up to this listening that the DC circuit, single phase AC circuit, 3 phase AC circuit, resonance, maximum power transfer theorem and magnetic circuit.

My suggestion is that you take not too many books no need to pick up too many books, you take one or two good books it solve few examples and practice little bit more right practice little bit more and just see whether you are you have been able to solve it or not, if you have any doubt or anything you ask in the forum will answer it, you will clear your doubt and we will answer your what you call all your all your queries right.

Whatever question comes to your mind you put in the forum will answer all your queries with that your this magnetic circuit is over, next will take the single phase transformer the magnetic circuit is over, you will find single phase transformer is very easy, you will really find it is very easy not at all difficult one with that.

Thank you very much will back again.