Fundamentals of Electrical Engineering
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Lecture – 40
Single Phase AC Circuits (Contd.)

So, we are back again. So, I hope you have understood this.

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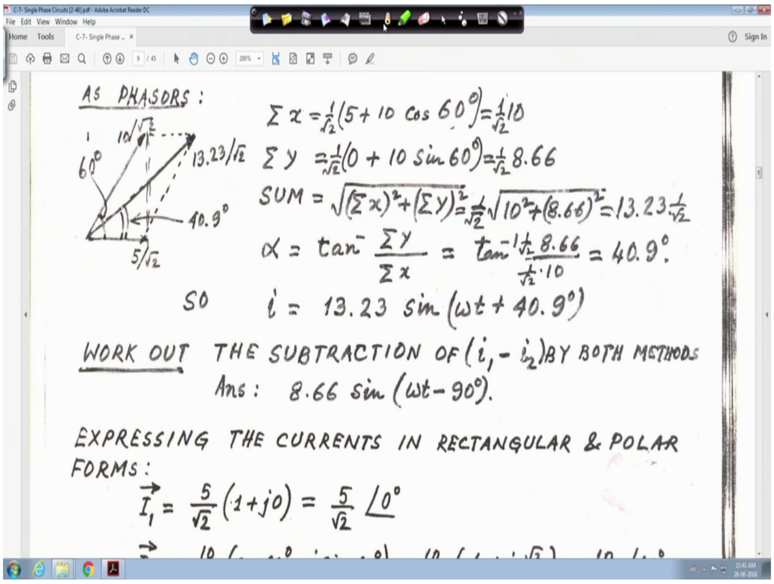

So, whenever you will draw phasor diagram, it should be in rms value. Keep it in your mind. Do not take your peak value right. Do not take, it is we and the way I told leading lagging lagging little bit understanding (Refer Time: 00:35) AC circuit. Anyway, you understood this way everything will find too easy right. So, so next is this is your an exercise is given to you find out i 1 minus i 2 by both methods. 2 methods I have shown and answer is also given here. This is your exercise, you will do it right.

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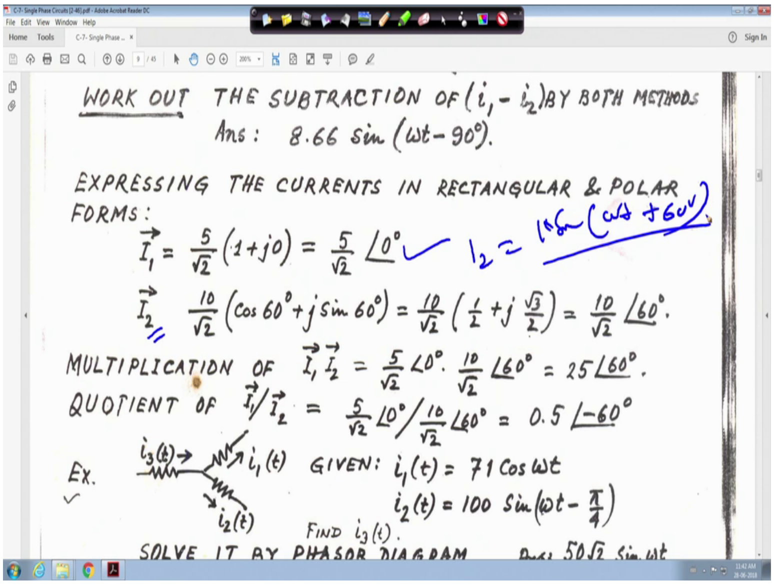

So now, expressing the current in rectangular or polar form right. Now, whatever these thing; so for example, for example, suppose I 1 is 5 by root 2 angle 0 and I the same data same data and I 2 is equal to your what you call I 2 is equal to it was taken know that your 10 sin omega t plus 60 degree right. This we will taken; so angle 60 degree and this is a peak value. So, when you do represent when you are representing like phasor right, it will be 10 by root 2. It is this is the rms value and angle 60 degree right.

So, if you multiply this I 1 and I 2, it is just for this thing. So, it will be 5 into 10 50 by 2; so 25 and 0 degree plus 60 degree. So, ultimately it will given 60 degree and if you divide I 1 by I 2, it will be 5 by 2 angle 0 degree and 10 by 2 angle 60 degree. It will be 0.5 angle minus 60 degree. It is something like this suppose numerator if you have angle theta 1 and denominator.

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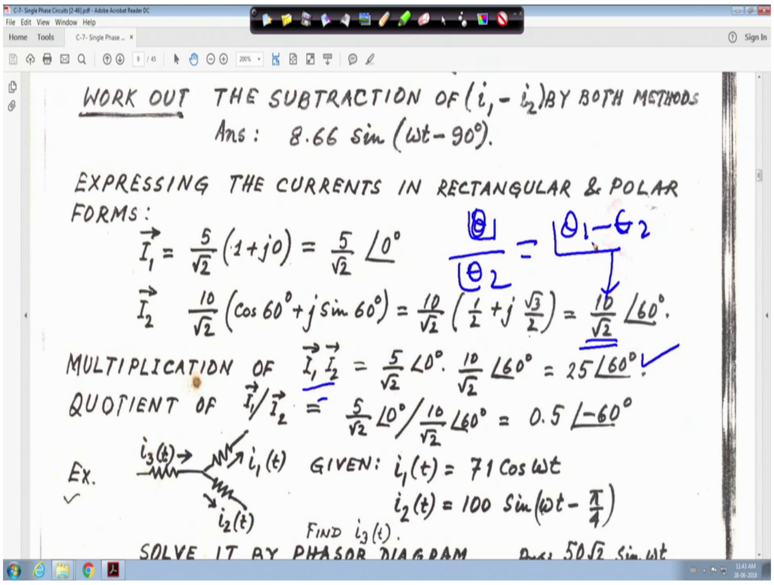

If you have angle theta 2, then this one will be angle theta 1 minus theta 2 right. So, this angle will be subtracted from this one. If you write angle in the numerator and your what you call in the numerator right.

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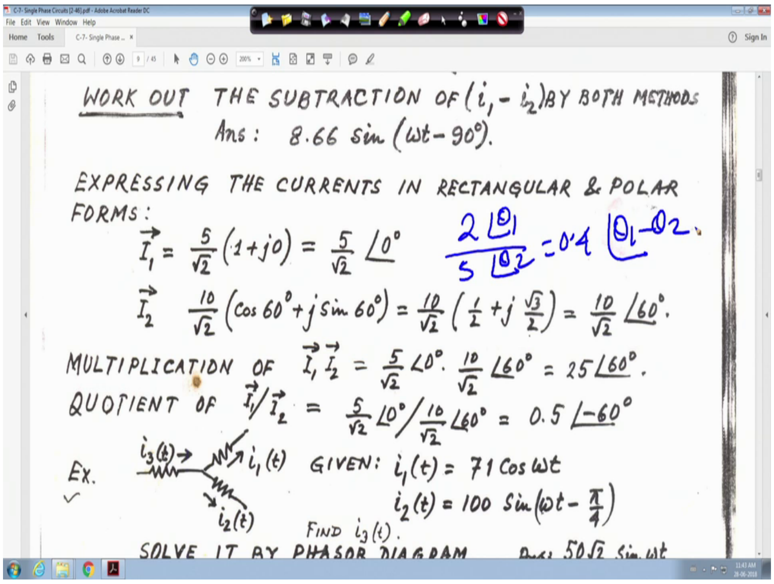

Now, suppose if it is given for example, suppose 2 angle theta 1 divided by 5 angle theta 2. So, 2 by 5 is 0.4 angle theta 1 minus theta 2 right. This way you can write.

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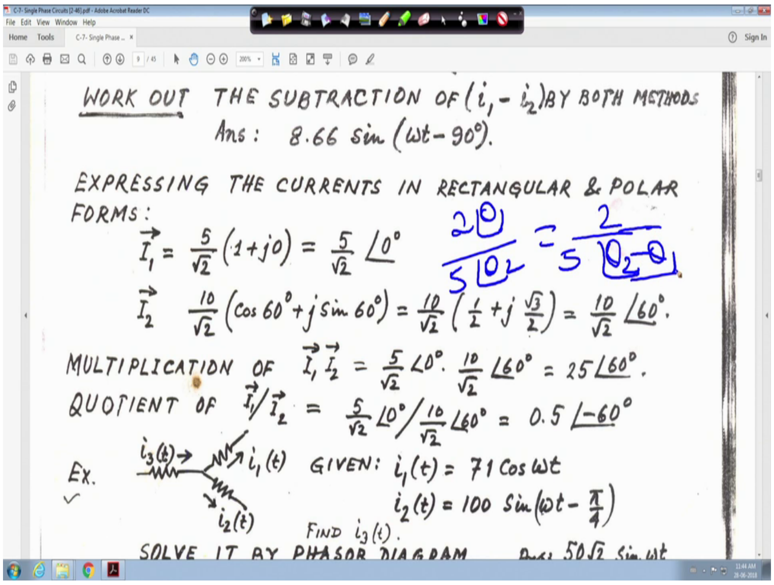

Now, again let me clear it. Suppose 2 by angle theta 1 by 5 by angle theta 2. Suppose, this numerator angle theta 1 minus 3, but if it is denominator if you want, then it will be 2 by 5. Then, if you write this way, if you require it will be theta 2 minus theta 1, right.

So, the way you want. So, in this case, you are this case you are it is 5 by root 2 by 10 by root 2. It will be 0.5.

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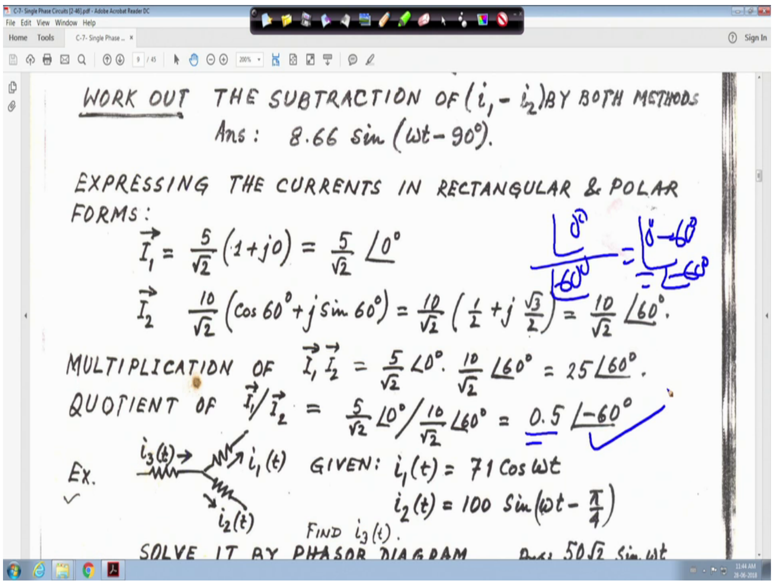

And it was actually angle 0 degree by angle 60-degree numerator 0-degree denominator 60 degree that was actually coming 0 degree minus 60 degree is equal to angle minus 60 degree. That is why it is minus 60 degree right. So, hope this is from your this is from your higher secondary mathematics in complex numbers chapter right class 11.

So, let me clear it. So, one numerical is given that we will solve it. This is one your numerical is given i 1 i 2 and i 3. You have to find out here you will put what you call KCL i 3 is equal to i 1 plus i 2 right. And accordingly you will do it. So, whatever things are given, it is given i 1 t is given this one i 2 t is given. This one you have to find out what you call i 3. The answer you have to find out find i 3 here it is given find i 3 t. So, answer is given 50 root 2 sin omega t. This we will do another exercise right.

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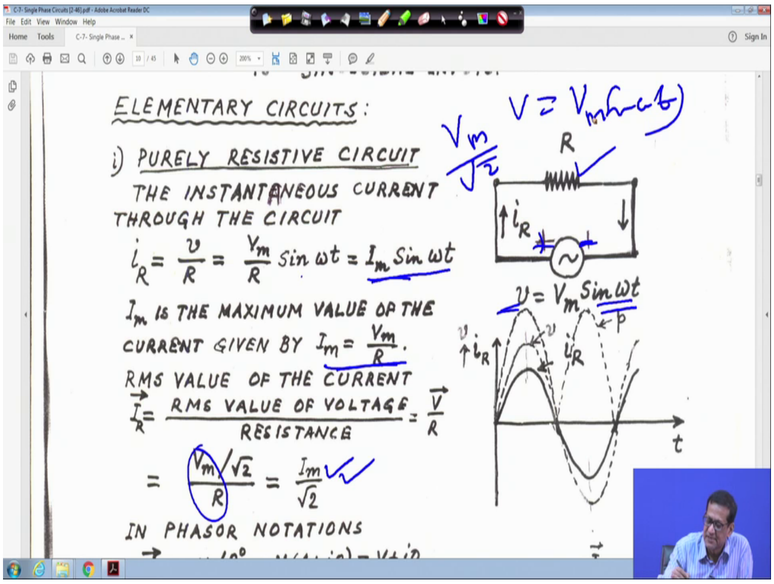

Now, next is the steady state response of R L C circuit to sinusoidal input. So, we will considered 1 by 1: first, elementary circuit, a purely resistive circuit. Suppose, in this case, in this case circuit is purely polarity is instantaneous. This plus minus polarity is instantaneous right. And in this case, your voltage source V is equal to V m sin omega t. So, in that what you call you we have to find out I R and power loss etcetera right.

So, in that case, generally we write say i R is equal to V upon R. Because, this is the voltage V is equal to V m sin omega t and this is the R it is a resistive circuit. So, it is V is equal to V m sin omega t. So, it is V m upon R sin omega t and this is your is equal to you can write I m sin omega t and I m is equal to actually V m of upon R. This is the maximum value of the current. We are not making here rms value and other thing right now.

Now, rms value of the current is that I R is equal to rms value of voltage by the resistance right. So, V m is the maximum value. So, it is rms value is equal to V m by root 2. So, rms value of the current is your V m upon root 2 divided by R, that is equal to actually I m by root 2. Because, I m is equal to V m by R. So, here if you put I m is equal to V m by R it is I m by root 2 right. This is what you call that current. Now, question is that that this is your V is equal to V m sin omega t V is equal to V m sin omega t right. Let me let me clear it again. Then it will be easier.

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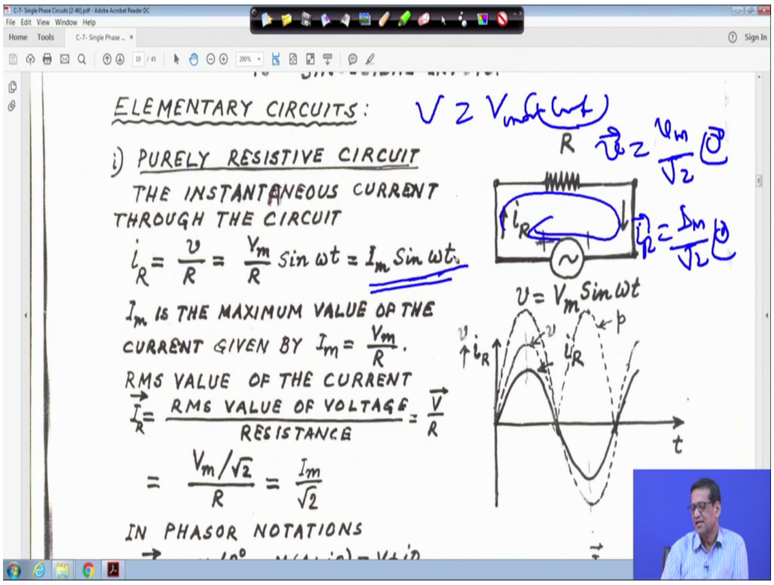

Suppose, V is equal to V m sin omega t, right; so, in this case, this is low angle associated that it is omega t plus 0 degree right. If you if you your what you call if you put it in a phasor form right. So, you take rms value. Therefore, we can write say V is V arrow you are putting is equal to V m by root 2 angle 0 degree V m by root 2 is rms value of the voltage right. Similarly, current also we have got I R is equal to I m sin omega t; that means, my is this current is I R. This is moving like this current is I R.

So, my I R is equal to somewhere I am writing here I R is equal to my I m by root 2 angle 0 degree. Because, here also no angle associated with that both V and I are angle 0 degree; that means, they are in the same phase. They are in the same phase, that is where it has been done. Here, they are in the same phase both I R and V both are in the same phase right.

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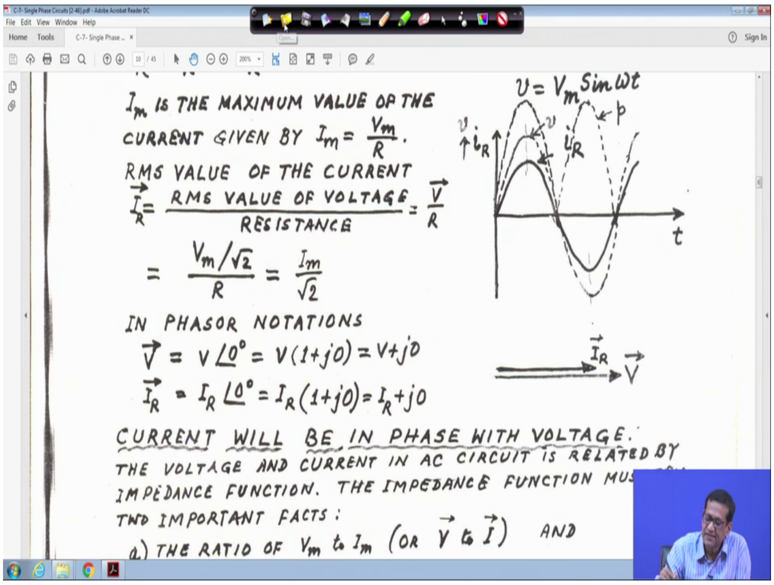

So, both angle 0. So, both are in the same phase. Now, that means, V is equal to we can write V angle 0. So, V is the magnitude, sorry V is the magnitude of the voltage. So, V an angle 0 means cos 0 plus j sin 0 cos 0 is 1 and sin 0 0. That is why, you can write V plus j 0. Similarly, for current I R angle 0; so cos 0 plus j sin 0 degree. So, that is becoming I R plus j 0 1 plus j 0 right. So, current will be in phase with the voltage. This is the current will be in phase in the voltage right. So, power will come will come next to power right. So, let me clear it.

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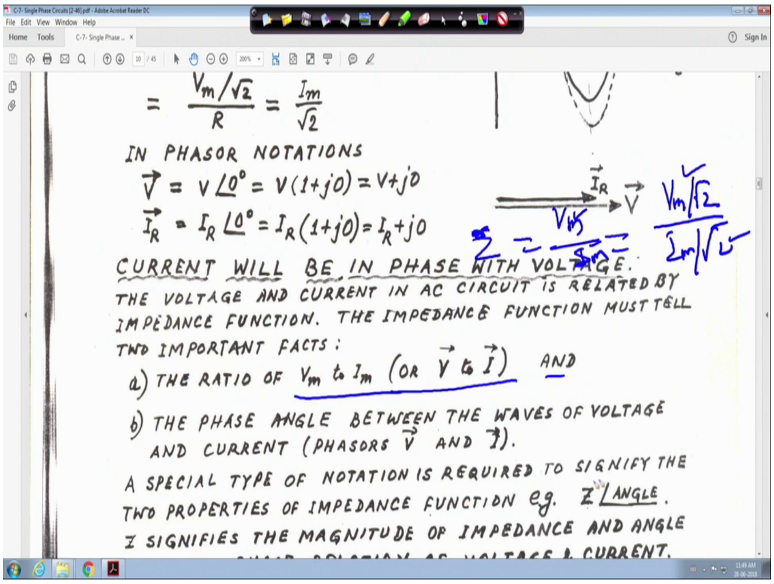

So, in this case, current will be in phase with voltage. So, and your what you call then AC circuit is related by the impedance function. Now, question is that impedance function must tell 2 important fact; the ratio of V m to I m or V to I. That means, if you in AC circuit, you basically, we will term with impedance. So, impedance will be Z right, impedance will be Z right.

So, we will put Z bar a complex number is equal to you can write either V m by I m this one or is equal to you can write V m by root 2 divided by I m by root 2. That is, rms value rms value of the voltage rms value of the current or peak value of the voltage peak value of the current right. So, this is actually complex your what you call your complex number.

So, if Z impedance is not a phasor quantity, I will come later right. So, it will be either it will be rms value by rms value of voltage by rms value of current this magnitude. This is magnitude only. It is angle this is a magnitude only; so better not to bar now. So, it is magnitude only. Angle we will see later. So, it is it is actually either peak value of the voltage by peak value of the current the magnitude of the impedance or rms value of the voltage or rms value of the current that is what has been main said here right.

So, so it can be in the case of what you call resistive circuit, in the case of resistive circuit, this one actually only R is there. It is not impedance; actually is a complex quantity.

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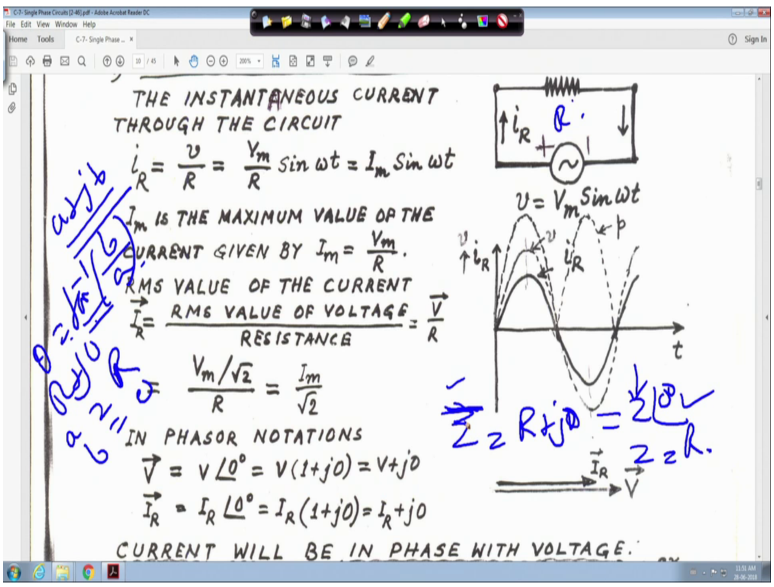

But, in the case of R this is this is only R right. So, Z is equal to we can write R plus j 0 right. So, X is not there. Reactance part we will see later. So, X is not there.

So, Z is equal to here you can make Z is equal to R plus j 0 is equal to we can write Z angle 0. Because, what you call this is your 0 and this is R. So, it is complex number right. It is a complex number. So generally, you know that if a plus j b is the complex number right, then this angle theta is equal to tan inverse your b by a right this you know.

So, in that case, in that case, if it is made R plus your 0 j 0; that means, a is equal to R right and b is equal to 0. So, it will be 0 by R. So, theta is equal to 0 that is why angle is 0 right. So, that is why Z is equal to this Z is the magnitude and Z is equal to basically R only resistance.

So, this is your and this we represent no arrow. When we will go through it by, you know writing error, I will I try to rectify everywhere. Do not put arrow, that this is not a phasor quantity. It just to represent complex number you put Z bar. It is not a phasor quantity. If voltage and current both are phasor quantity, but Z is not a impedance, it is not a phasor quantity right.

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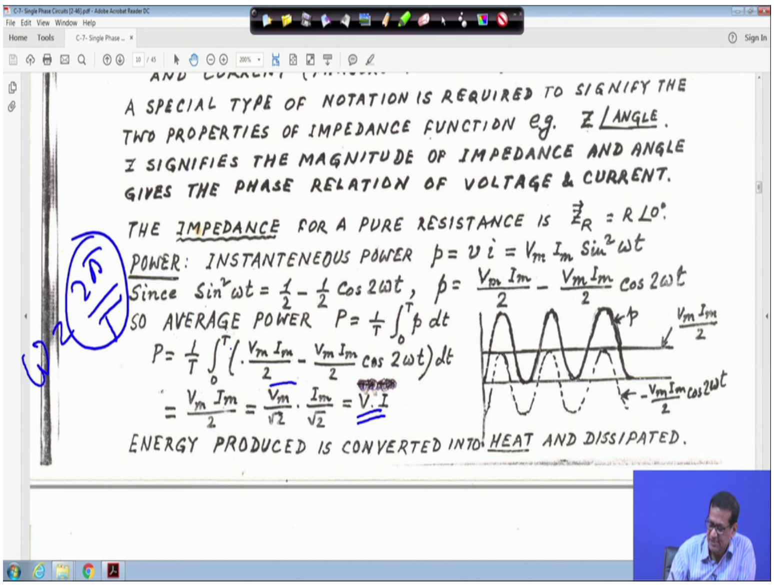

So, next is this is the notation this is the notation right. Now, next that is here written example Z angle. So, everything is written the. Now, next is the power, the impedance for a pure resistive circuit. Here, it will be bar only, no arrow right. Many places it is there. This is my writing error. So, please I am rectifying it.

So, this is actually R angle 0. Whatever I told, you right Z is equal to R. R; angle 0. Now, instantaneous power because, AC circuit it is time bearing. So, instantaneous power p is equal to v into i right. So, v is equal to V m sin omega t and I is equal to I m sin omega t. So, if you multiply this, it will be V m I m sin square omega t right. This is thing or p is equal to that cos 2 theta is equal to 1 minus 2 sin square theta. Therefore, sin square theta is equal to 1 minus cos 2 theta by 2.

So, here it is 1 minus cos 2 omega t by 2. So, if you do. So, it will become V m I m by 2 minus V m I m by 2 cos 2 omega t. This you know. So, once if you done then the, so the average power you take p is equal to 1 upon T 0 to T what you call p dt right, the average power.

So, if you take average power, then this one you are this is actually this 2 if you look at the plot, this is a constant term V m I m by 2 right. So, this is my V m I m by 2 line. This is my V m I m by 2 line. It is shown and another term is double frequency minus V m I m by 2 cos 2 omega t right. So, this one is my minus V m I m by 2 cos 2 omega t. Now, when you plot together, if you plot together, this thick line, this thick line, this one is your p right, this is the p plot. So, when you try to your integrate over the total time interval the average power right. So, p is equal to your 1 upon T 0 to T your V m I m by 2 minus V m I m by 2 cos 2 omega t dt.

If you just integrate this, you will get it is V into I. V is the rms value and I is the rms value of the voltage and I is the rms value of the current right. If you integrate it using that relationship right, omega is equal to 2 pi by T. This relationship you will get V into I and it is V m by root 2 that is V and I is equal to I m by root 2; that means, my V is equal to V m by root 2 V is the rms value and I is equal to my I m by root 2 that is the rms value.

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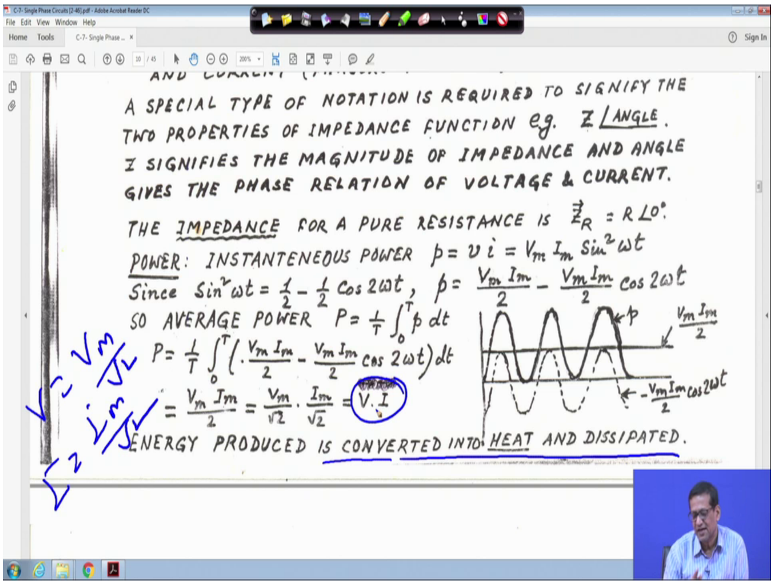

So, basically, it is a v into i because pure resistive circuit. So, this is the power v into i and energy produced is converted into heat and dissipated right. Whatever energy you will produce, that will be dissipated in the resistor because, is a pure resistive circuit right. So, this is your v into i. So, for resistive circuit with AC supply V is equal to V m sin omega t power is equal to V is equal to p is equal to v i. But, in this case, V should be rms value of the voltage and I should be rms value of the current right.

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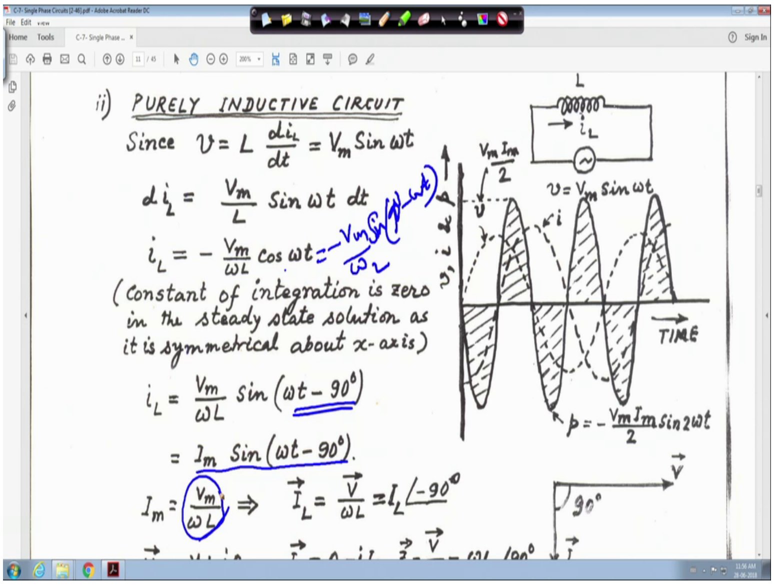

Next is that, next is a purely inductive circuit little bit little bit understanding. Here, we have to I mean, what I have done actually, this first taken one single element at a time such that, we will try to see our concept how is it right. So, next is the purely inductive circuit, purely inductive circuit.

So, in this case, instantaneous polarity will be there. I have missed it. It is plus minus say, it is inductive circuit, it is L no other element is there and current flowing through this is i L and instant it and polarity instantaneous polarity right. So, in that case, we know that V is equal to L into d i L by dt right is equal and V is equal to it is given V is equal to V m sin omega t.

So, L into d i L upon dt is equal to V m sin omega t right. Therefore, d i L is equal V m upon L sin omega t dt. If you integrate, if you integrate you will get i L is equal to minus V m omega L cos omega t right. So, this constant of integration is 0 in the steady state solution as it is symmetrical about X axis. So, there is no constant of your of integration right.

So, it is simply i L is equal to minus V m upon omega L cos omega t right. So, this 1 i L is equal to minus V m upon omega L cos omega t. You can write V m upon omega L sin omega t minus 90 degree. How we are writing? So, let me let me clear it; so this one, this cos omega t. You know that this, this one you can write minus V m by omega L cos omega t, you can write sin 90 degree minus omega t and this minus is there. When you go this sin term and when minus going inside, it will be omega t minus 90 degree. That is why, i L is equal to V m upon omega L sin omega t minus 90 degree right.

So, this one; that means, this one is equal to it can be written I m is equal to sin omega t minus 90 degree. That means, this I m is equal to actually V m upon omega L I m is equal to V m upon omega L right.

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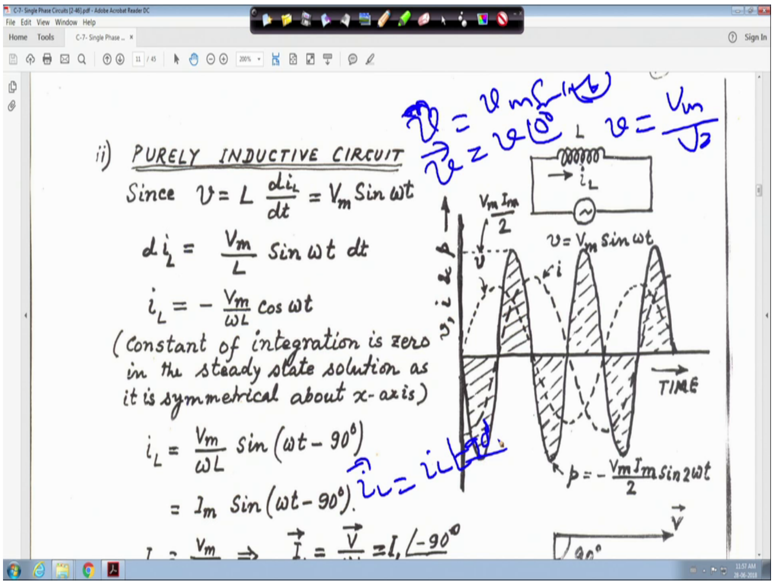

So, let me clear it. So, in this case, in this case, your this voltage is V is equal to V m sin omega t. So, let me write it here V is equal to V m cube sorry V is equal to V m sin omega t right. No angle associated with that. If you put in this thing, V is equal to is equal to V V is the rms value, that is V m by root 2 and it should be angle 0 degree, say right and V is the rms value. It will be V m by root 2 right. Similarly, here current is equal to I m sin omega t minus 90 degree.

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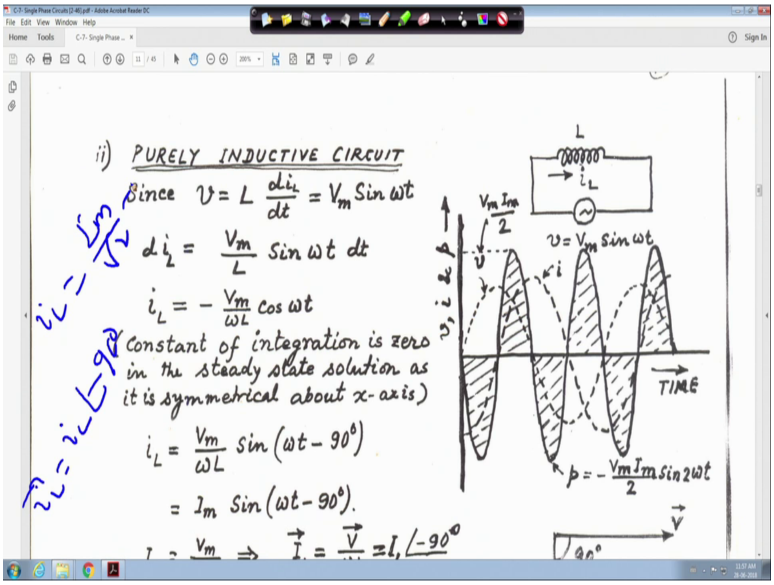

So, this i L; it can be written it can be written as say i L. This is phasor quantity say i L angle minus 90 degree. It is angle minus 90-degree right. Just, just hold on, let me write here. This i L this i L is this is phasor quantity. If you write this is the rms value angle minus 90 degree and i L is equal to it is I m by root 2 right; that means, it is minus 90 degree.

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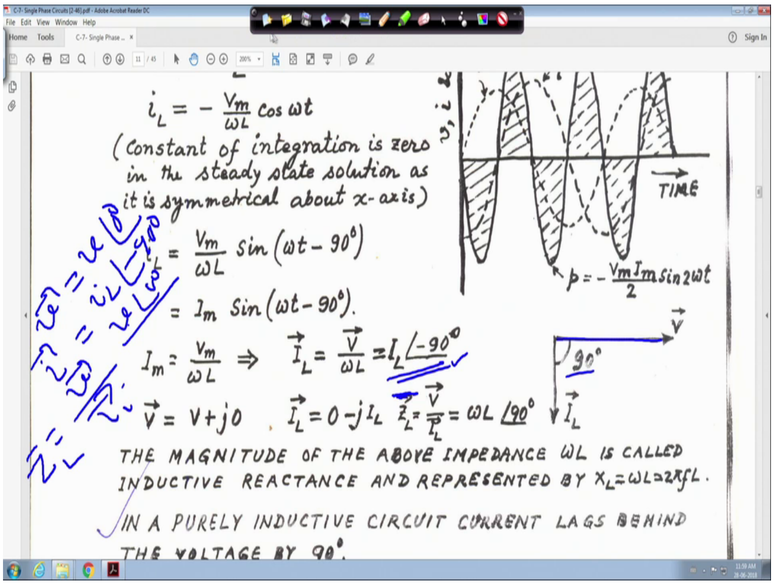

That means let me clear it. That means, from here, this diagram, I will come to later; that means, this is my voltage, this is my voltage phasor, that is V angle 0 and current, I told you it will be here. It is written here I L minus 90 degree.

So, current lacks from the voltage by 90 degree from purely inductive circuit and here it should not be arrow it should not be arrow it should be just Z bar the complex number. Now, that means if you look like this right. For example, if you if you look like this v is equal to your V rms value. Say, angle 0 degree and I right, I is equal to I L angle minus 90 degree right.

So, this is my your this thing, then Z actually, Z actually V arrow divided by your I arrow. That is, whatever it is written here right, whatever is written here, this is we are putting Z L. So, put Z L is equal to V and this thing if you do. So, and you know that V is equal to what you call V angle 0 right and I is equal to you know this is rms. It is what you call, it is rms value.

So, I this i L is equal to your V, your V m. Yhis is rms value, that is V m by root 2 and this one also this angle is minus 90 degree. That means, this is I can make just hold on let me clear it. Let me clear. Otherwise becoming clumsy just becoming.

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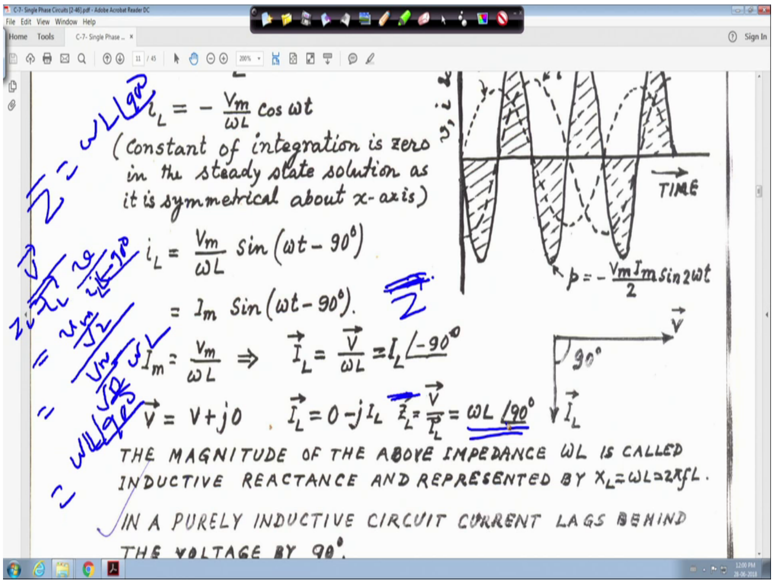

So, my here I am writing my V arrow divided by I arrow that is my Z L right is equal to I can write that V rms right. It is V divided by my I L angle minus 90 degree right. This is my I L angel minus 90 degree. So, V is equal to V m by root 2 and I L is equal to that is rms value I m by root 2; that means, V m by your root 2 right. Then, this is root 2 then omega L this actually is equal to omega L angle 90 degree right. So, this is omega L angle 90 degree; that means my Z bar will be omega L angle 90 degree right.

So, same thing same thing here has been made that is this is also put bar. So, V (Refer Time: 19:21) omega L angle 90 degree. Little bit you do, little bit practice is required initially right. So, there should not be any confusion anywhere. Wherever Z bar I have written, it is by mistake. Put simply bar to represent the complex number. Because, Z is not in what you call phasor quantity. So, it is simply complex number right. Real part and imaginary part (Refer Time: 19:35). We see later. So, this is actually omega L 90 degree; that means, for inductive circuit then, let me clear it.

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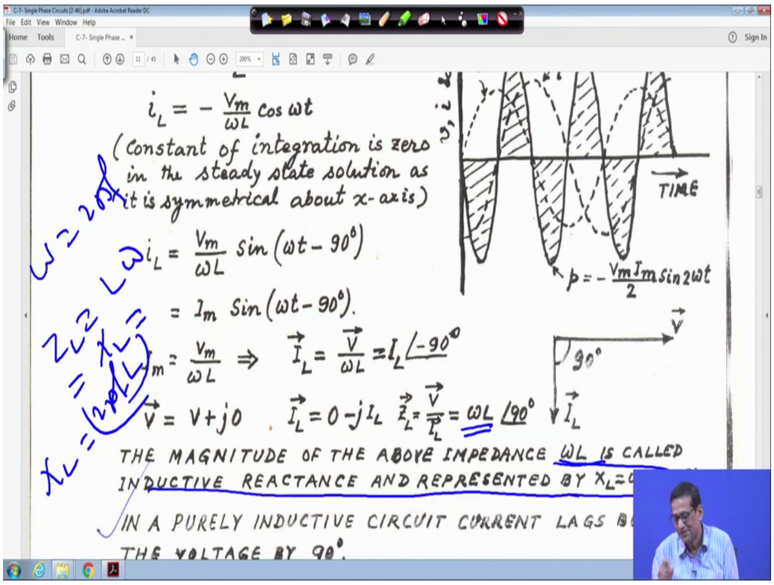

So, for inductive circuit, your what you call this is my your Z L; that means, Z L is equal to your L omega. Sometimes, we call X L that is the reactance of the your what you call of the circuit only reactant. So, inductive reactant L omega and omega is equal to 2 pi f. Therefore, my X L is equal to 2 pi f into L right.

Later, when we solve the numerical you will know that. So, this is actually your what you call the magnitude of the above impedance is omega L is called inductive reactance I represented by X L is equal to L omega is equal to 2 pi f into L. Everything is written there here notes actually little bit clumsy because, very closely written here. But, whenever you read it, if you have anything just simply you zoom it. That is all right.

So, next is this that; that means, if you look into this, power will come. Now, if you look into this, that this is my this dash line is the voltage, this is the voltage waveform. Because, V is equal V m sin omega t. So, start from it is starting from 0 and in the case of I, it is lagging by 90 degree. That is why, I is starting from here, I is starting from here right. This is I is lagging by 90 degree.

And this is the expression of I sin omega t minus 90 degree right. When omega t is 0, I m is equal to sin minus 90 degree, so minus I m. So, here it is starting. This is your minus I m. I is starting from here right. So, let me clear it.

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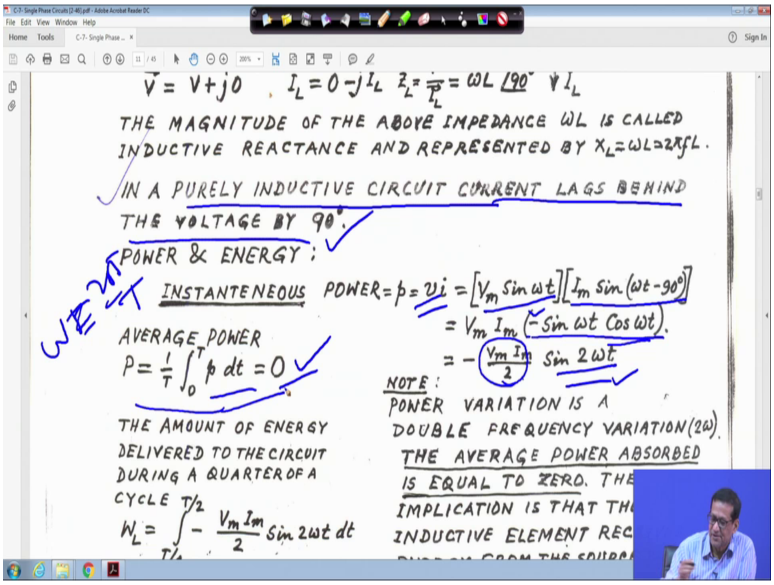

So, next is power. Here power graph is there will come first you come here now. So, that means, in a pure that what I told purely inductive circuit, current lags behind the voltage by 90 degree. This we show got it from phasor diagram the instantaneous power instantaneous power p is equal to v i. In a inductive circuit, V is equal to V m sin omega t and you will got T is equal to I m sin omega t minus 90 degree.

That means, V m I m and if you it will be minus sin omega t into cos omega t, because, it is your sin omega t minus 90 degree. Take minus sin out. It will be there. So, it will be sin 90 degree minus omega t. So, that is cos omega t. That is why, minus sin omega t cos omega t.

So, this was your multiplying numerator and denominator by 2. So, it will be minus V m I m by 2 into 2 sin omega t cos omega t that is, 2 sin theta cos theta that is sin 2 theta. That is why, it is written minus V m I m by 2 sin 2 omega t. This is p is equal to v i. Now, the average power average power 1 to T if you then it will become 0. This you put and integrate it. Use this relationship always omega i is equal to 2 pi by T right. This relationship is always used.

So, if you make average power for inductive circuit 1 by T 0 to T p dt, it will find 0 because, there is no resistor here. So, there is no question of power in the in purely inductive circuit right. So, let me delete it. So now, in that case if you look that power, this is at this is at double frequency right.

So, if you look into that, that your power variation is double frequency variation of 2 omega. This is 2 omega because, it is 2 omega right. The average power absorbed is equal to 0; that means, the implication is that the inductive element receives energy your from the sources during 1 quarter of a cycle of the applied voltage and returns your exactly the same amount of energy to the driving sources during the next quarter your what you call quarter of a cycle. It is a double frequency.

So, let me clear it. Come to this figure. Now, if you come to this figure, this is your power expression, this is thick line is your power expression right. This thick line is the power expression.

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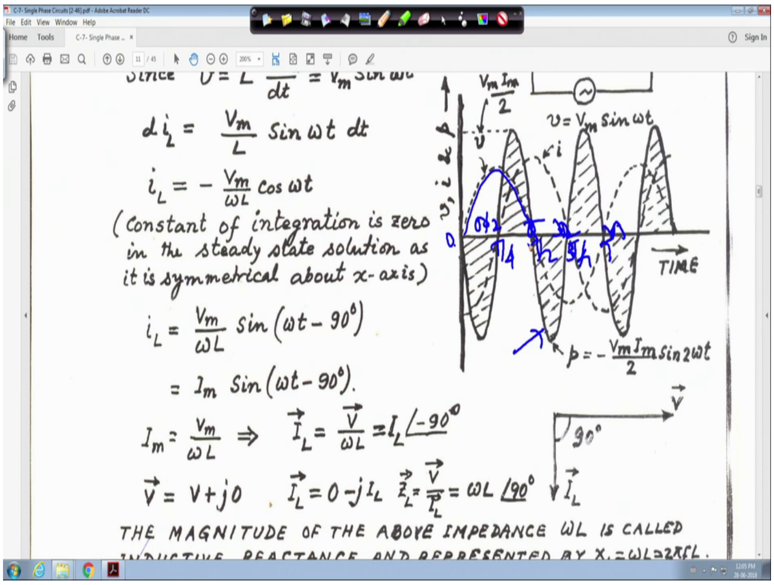

So, if it is 0 it will be T by 4, it is T by 2, it is 3 T by 4 and it is T. I mean, that means, if it is if you take this one, this is 0, this is what you call pi by 2. This is pi and this is your 3 pi by 2 and this is your 2 pi right.

So, if you look into that, that that this current or voltage. It is actually computing half cycle in your in between 0 and pi right. Let me clear it for.

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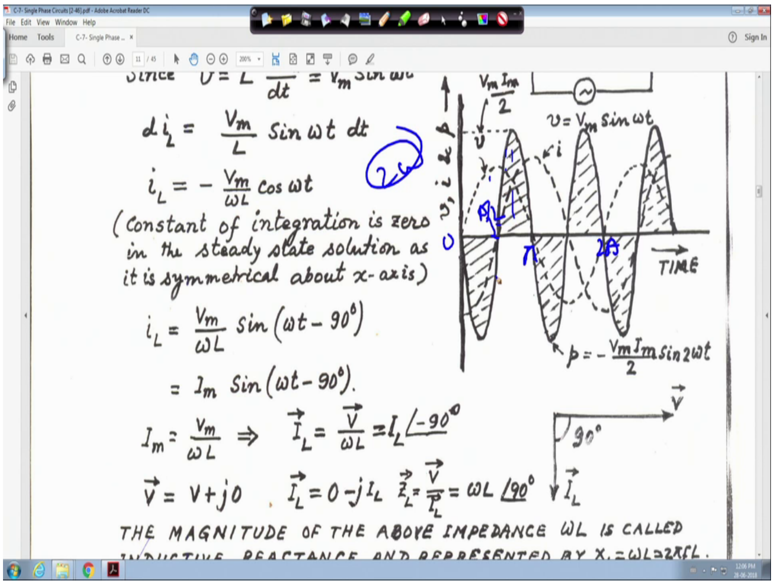

Suppose, this is 0, this is pi and this (Refer Time: 24:22) this is 2 pi. So, if you look and look at this point, it is your what you call pi by 2 right. So, whereas current or voltage whatever it is take. For example, voltage it is completing half cycle in pi 0 to pi. Whereas, this power actually it is completing in what you call compete 1 cycle in what you call in pi. Because, frequency is 2 omega right double frequency; that means, in what; that means, this each one is a quarter your what you call your quarter cycle.

So, this each part, it is receiving energy another cycle another quarter. It is what you call sending back. It is your what you call delivering back the sources right. So, 1 1 quarter cycle, it will absorbed another quarter cycle, it will return.

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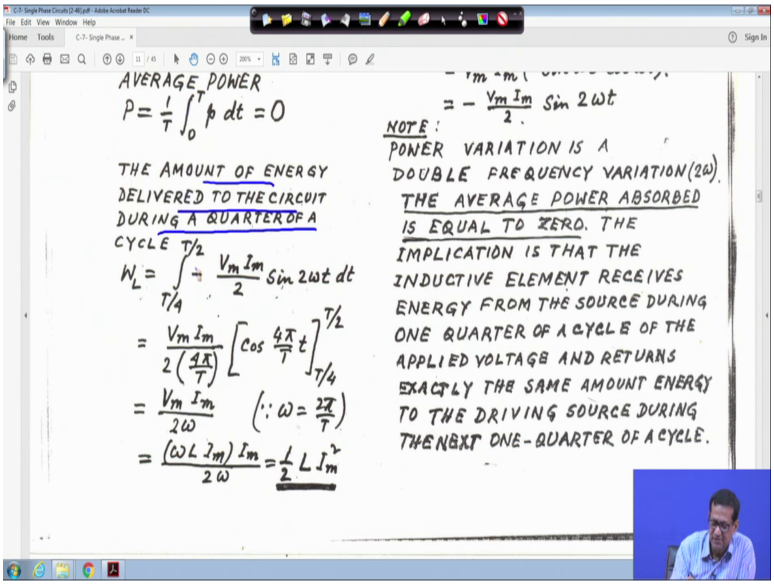

So, let me clear it. So, that is what I have written here. What it has been written here that, the average power absorbed is equal to 0 that is here it is given. You please do this integration. It is simple thing. The implication is that the inductive element receives energy from the source during 1 quarter of a cycle. I told you that because, in 0 to pi, it is completing 1 cycle. So, that means, in 2 in 2 pi, it is completing 2 cycles because it is a double frequency.

So, that is why, it receives energy from the source during 1 quarter of a cycle of the applied voltage and returns exactly the same amount of energy to driving source during the next 1 quarter of the cycle right. And the amount and the amount of energy delivered to this thing circuit during this.

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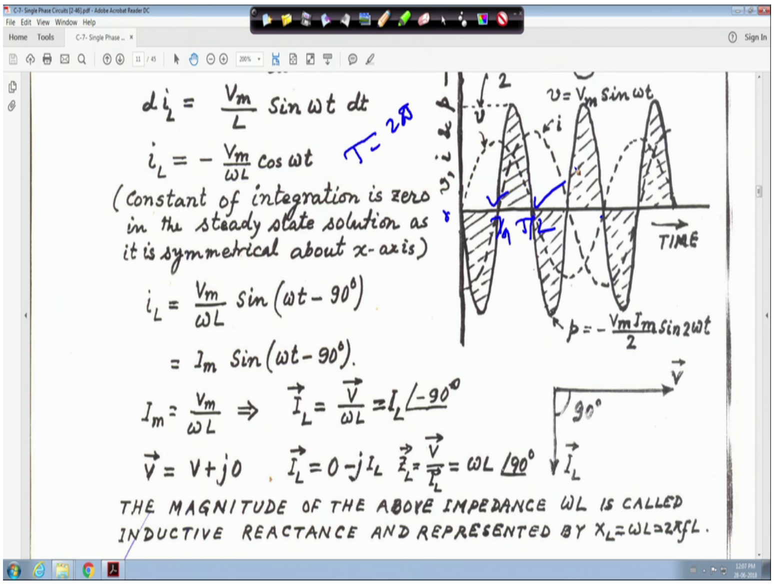

So, we will take it integration will take T 4 T by 4 to T by 2 why, if you come to this if you come to this, this is if we take this is 0, then this point is T by 4 and this point is T by 2 and this is 3 T by 4 and this is T. T is equal to if you take this way, T is equal to 2 pi right. So, this is; that means, we have to integrate from T by 4 to T by 2. Therefore, right.

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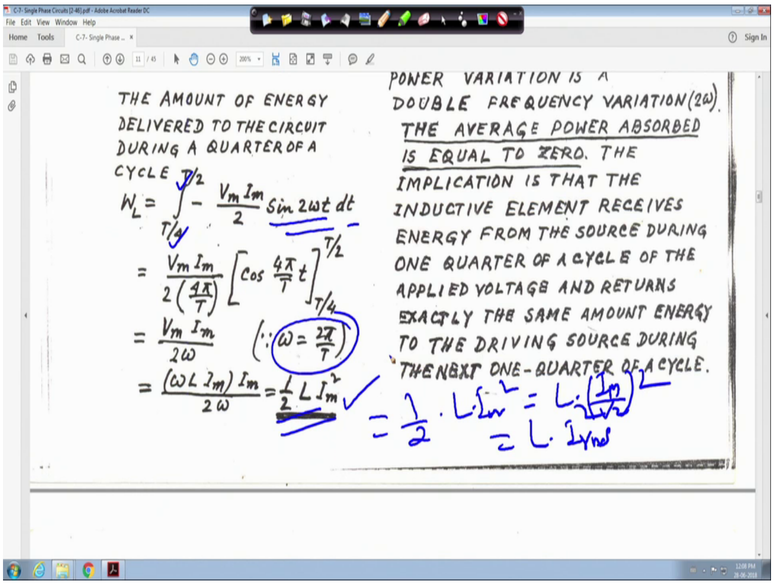

Therefore, if you do, so, if we do, so, the T by 4 to T by 2 and it is minus minus V m I m by 2 sin 2 omega t dt, if you integrate and simplify use this relationship omega is equal to 2 pi by 2, it will be simply half L I m square. That means, half L right into this I m square is equal to you can write L into I m by root 2 square; that means, L into I rms square right.

So, whatever we know that in an AC circuit, we know that energy stored is half L I m square. So, if somebody says half L I square means, it is R m peak value, not the rms value. If you take the rms value, it will be L into I rms square right. That is why, it is half L I m square right.

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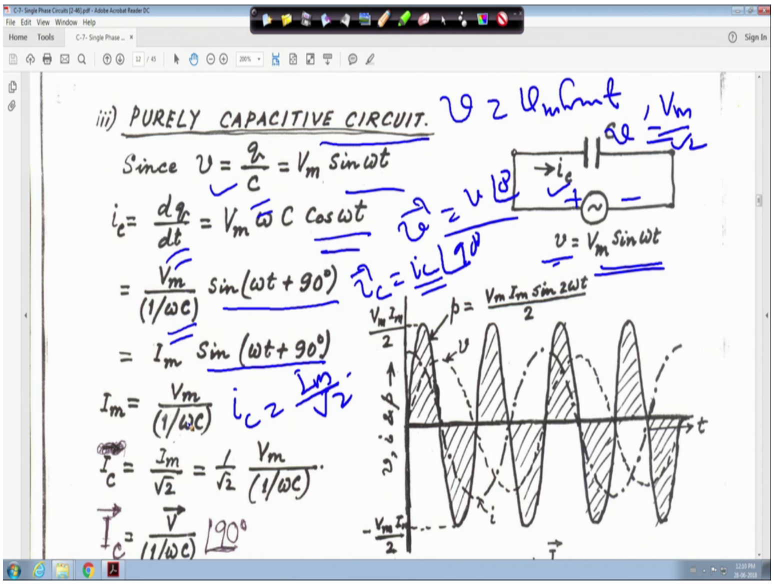

Similarly, similarly, purely capacitive circuit right, purely capacitive. Same philosophy will be applied. Same philosophy you follow the way inductor just it will be opposite right. So, in this case, in the case of purely capacitive circuit; we know q is equal to C V from DC circuit analysis we have seen. So, V is equal to q by C is equal to V is equal to V m sin omega t. Same thing we have taken and instantaneous polarity is there plus minus right and that means, if you take; that means, i C is equal to dq by dt. You know that.

Therefore, this one should be V m omega C cos omega t right. This is what you call, if you to take the derivative of this one that i is equal to dq by dt. So, it will be V m your omega C cos omega t.

So, you can write sin 90 degree plus theta is equal to cos theta. Therefore, you can write this 1 V m upon I C is equal to V m upon 1 upon omega C sin omega t plus 90 degree right. That means, my V is equal to my V is equal to V m sin omega t right; that means, my rms value is V m by root 2 that is my V is equal to V m by root 2 right. That means, my phasor notation. It will be V angle 0 degree. That means, this one you can write. Similarly, for current, we got I m sin omega t.

So, this one in the current notation say I C, we are writing this current is I C, we are writing I C. So, i C is equal to we can write i C angle 90 degree because it is coming omega t plus 90 degree. Therefore, that I C actually is equal what you call this I C is equal to somewhere here I am writing that I C is equal to I m by root 2, because, this is rms value. Whenever you write phase value that it is rms value. So, I C is equal to I m by root 2 and this is I m by I m is given V m V m upon 1 upon omega C right.

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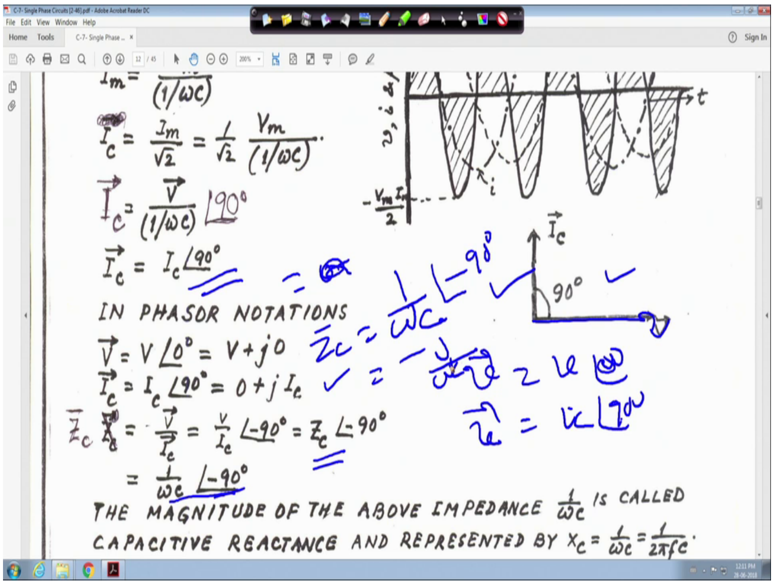

So, similar way if you proceed right. You will get that what you call you will get your Z. Similarly, the way the way I have mention. So, in this case, if you draw V. Actually, I told you V is equal to V angle then 0 degree and I C is equal to your I C angle 90 degree. So, in this case, current is plus 90 degree and this is 0 degree. So, this is my reference phasor V and this is I. So, I is leading V for purely capacitive circuit by 90 degree or other way V lefts from I C by 90 degree right.

So, this is my phasor diagram right and similar way, if you move similar way, if you move, you will see that your Z C actually is equal to omega C by 9 angle minus 90 degree in this case right. The way I have done for inductive circuit, same way you do it.

You will get the; that means, my this is Z C is equal to the magnitude that capacitive reactance is equal to 1 upon omega C and it is angle is your what you call minus 90 degree.

So, put bar; that means, it is actually 0, it is actually forget about 0. It is actually minus j upon omega C. Say, cos 90 degree minus j angle minus angle.

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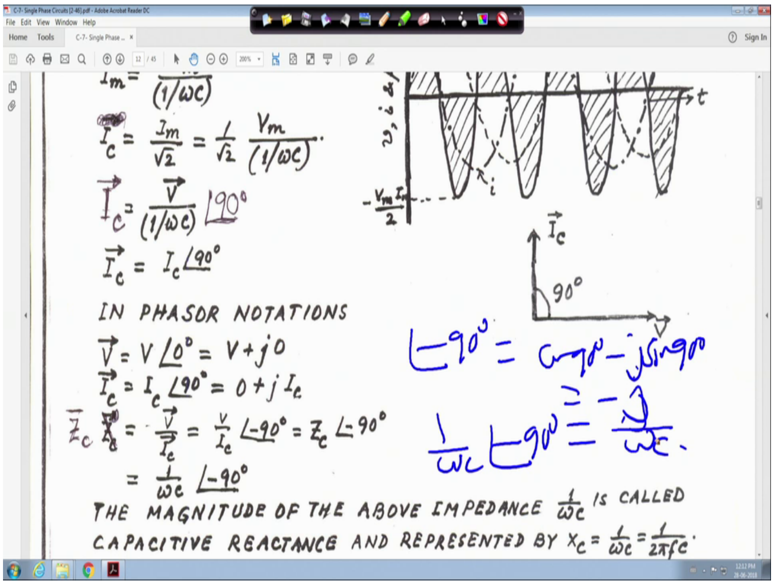

Let me clear it. Angle minus 90 degree is equal to cos 90 degree minus j sin 90 degree is equal to minus j and multiplied by this omega C. So, it will be j by omega C. So, you are 1 upon omega C angle minus 90 degree is equal to minus j by omega C right. This is j minus j by omega C. So, this is actually the magnitude. Actually omega is C is called the capacitive reactance right.

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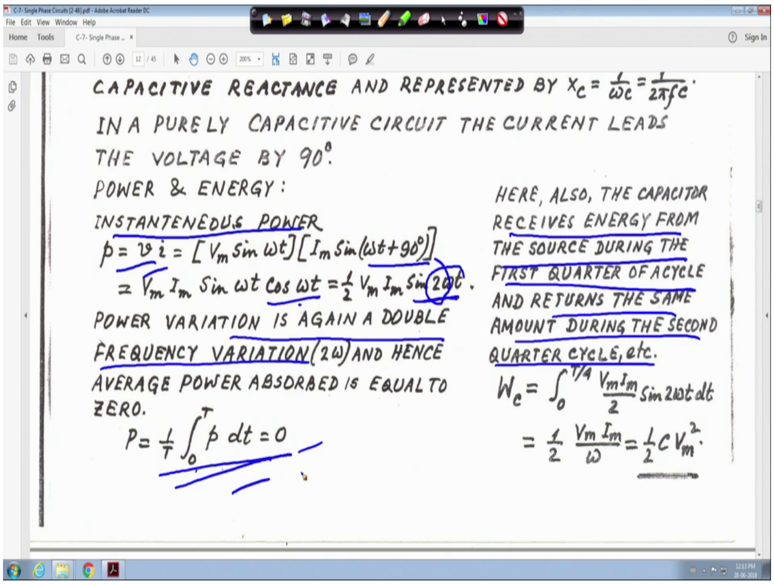

So, this omega C is actually is called that you are what you call that that capacitive reactance right and represented as X is equal to 1 upon omega C and omega is equal to 2 pi f. So, 1 upon 2 pi f C.

So, in purely capacitive circuit, the current leads the voltage by 90 degree. I showed you and power and energy right. So, just let me clear it. So, the power and energy the in a purely capacitive, your what you call that in your instantaneous power same as before p is equal to v i. If you make V m sin omega t into I m is equal to I m sin omega t plus 90 degree and if you just simplify this one, this one you make it, it will be V m I m sin omega t. Because, sin 90 degree plus omega t cos omega t multiply numerator and denominator by 2. So, it will be 2 sin theta cos theta. So, 2 is sin omega t cos omega t. So, sin 2 omega t, right.

And if you take the power P is equal to 1 upon T 0 to T p dt average power, if you take, it will become 0 right. So, power variation is again double frequency because, this is actually double frequency 2 omega right and is equal to 0 because there is no resistor there. So, where power will be, there will be no power. So, average power will be 0, but if you take the here also, the capacitor receives energy from the source during the first quarter of the cycle and returns to the same amount during the second quarter of cycle.

For example, for example, you come to this what you call this phasor this diagram. This is power plus this is voltage current here in the in the case of current is leading. That is why, when this is this is your I m this is your maximum on if the current.

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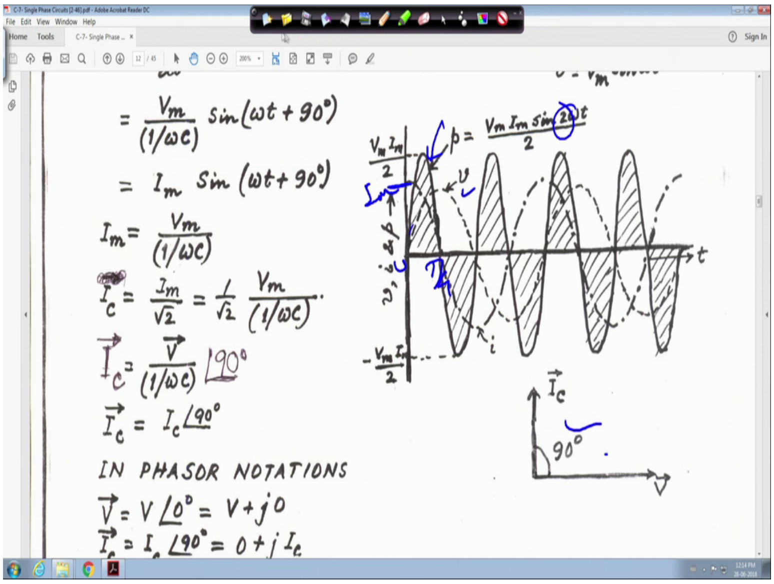

And current is leading by 90 because reaching is faster than the voltage. So, current is leading 90 degree. This is I C is equal to what you call peak value I m, that is V m upon 1 upon omega C and power is that double frequency. So, if it is 0, it is T by 4 then T by 2 and so on right.

So, same philosophy; so current in what you call in 2 pi, it will make one cycle. But in 2 pi, power will make 2 cycles. It will complete 2 cycles right. So, in this case if you do this 0 to T by 4 that only quarter cycle 0 to 2 by your what you call 4 V m I m by 2 sin 2 omega t dt. If you integrate this, it will become half C V m square. You know the store energy in capacitor as we have studied in DC half C V square.

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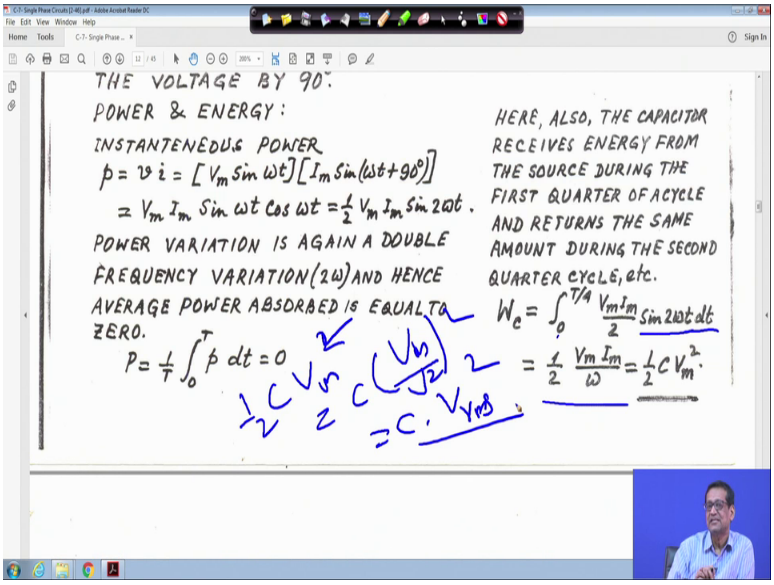

It is becoming half C V m square; that means, half C V m square right; that means, this one can be written C V m by root 2 square.

That means, is equal to C into v rms square right; that means, in AC circuit, whenever you talk about for your C V, C V square means your V is the peak value right or you have to make C into V rms square. That is, the energy stored in AC circuit and the capacitive circuit right. So, this is a purely capacitive circuit. So, what we have learnt that for purely resistive circuit power absorbed is, we have seen that is v into i right. In the in the case of a purely inductive circuit, power absorb is 0 average power absorb is 0.

Similarly, for capacitive circuit right, but energy in the pure inductive circuit; it will be half L I m square and for the capacitive 1. It will be half C V m square. This integration is very simple. You can do yourself.

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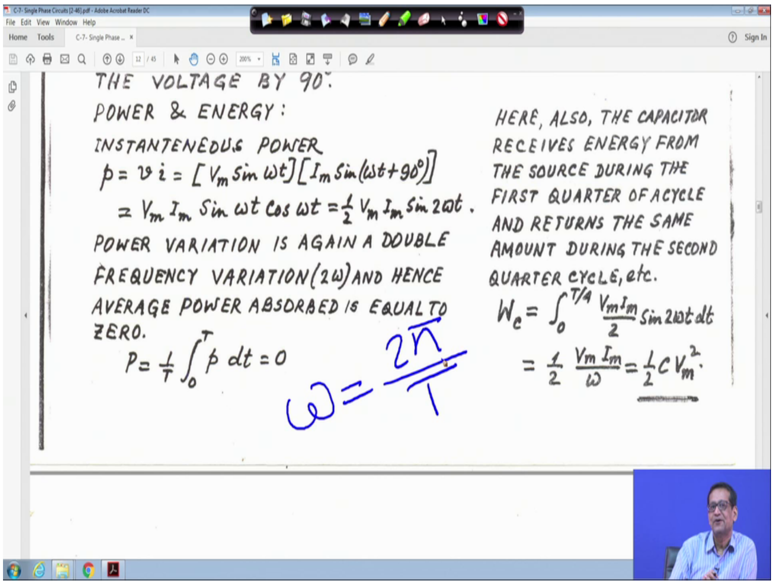

But, all the time you need to use this relationship sorry omega is equal to 2 pi by T. This there is a relationship you will use right, with this.

Thank you very much. We will be back again.