Fundamentals of Electrical Engineering
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Lecture - 39
Single Phase AC Circuits (Contd.)

So, we are back again. So now we will see the representation of an what you call sinusoidal signal by phasor, right.

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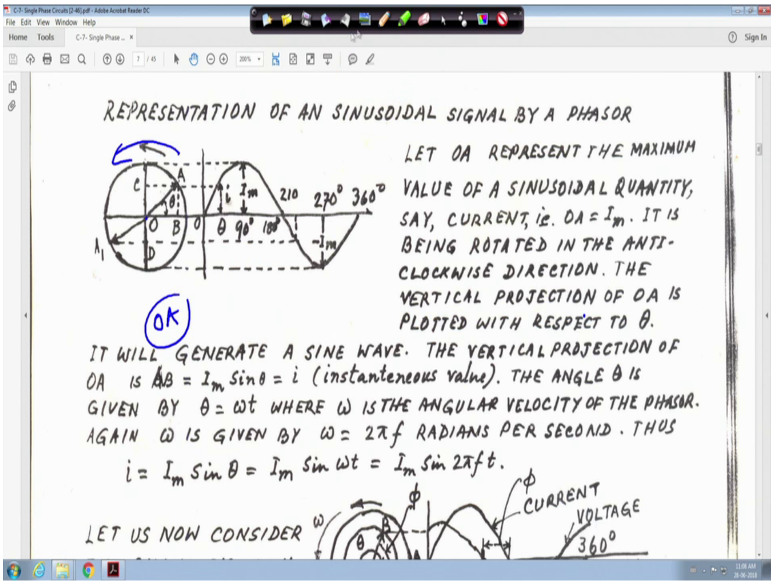

So, here actually first thing is that you know our understanding should be clear, such that you know for solving numericals or for getting ideas things will be totally clear, right. So, let us see how we can make it. So, representation of an sinusoidal signal by phasor if you look into that all, right up is there will come to that, but just listen that Suppose, you have you some what you call that O A, O A is that radius suppose O A, suppose this is center of the circle O and this is a O A represent that your maximum value of a sinusoidal quantity. It may be current, it may be voltage, right. So, in the and it is at this position it is rotating in the your what you call in the anticlockwise direction, right. So, in that case if you take suppose that vertical projection so that is A B.

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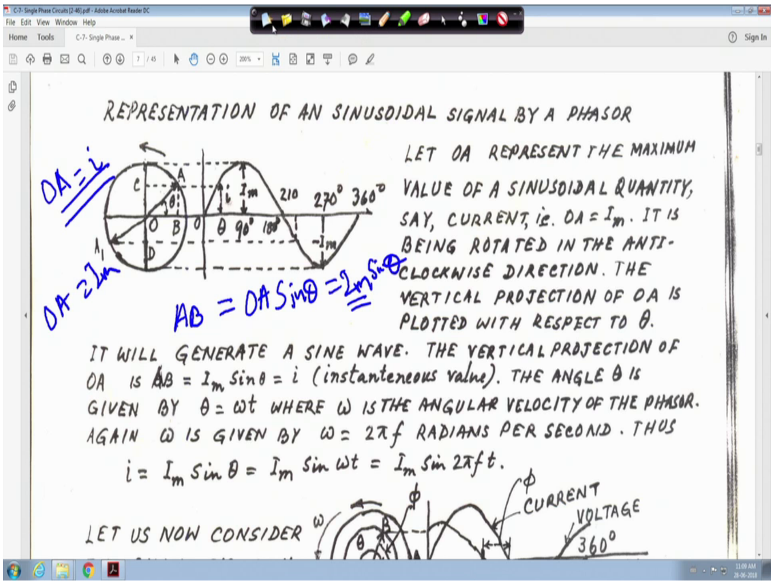

Let me clear it, say A B this is a vertical projection A B is equal to your O A. It is your sin theta vertical projection; that means A B is equal to right.

So, O A is the maximum value of what you call of a sinusoidal quantities. For example, suppose O A is equal to suppose; suppose this signal O A is equal to i, right. This is the current signal write i, I will say it is maximum value say O A is equal to I m that is the maximum value of the current the peak value of the current right; that means, this one is equal to your I m sin theta, right. And this A B is the maximum value that is I m that is O A O a rather O a, right. And A B is equal to I m sin theta, right?

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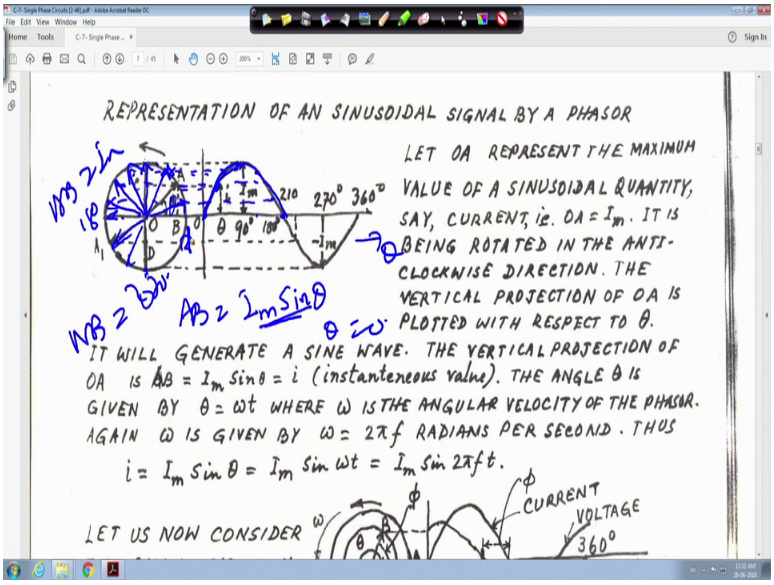

Now, let me clear it; that means, my A B that is the vertical projection of this is equal to I m sin theta.

Sorry, now when theta is equal to 0 right when theta is equal to 0, then A B is equal to 0, then A B is equal to your what you call is equal 0. So, make it a projection when theta is equal to 0. So, this is the origin here it is starting. Now if you take another value of another value of theta say, this angle is theta; this angle is theta for which A B is equal to I m sin theta. So, this way you take another point here. Similarly, for somewhere here, here you can take another point here for theta is increasing this is the theta, right.

Now this way when it will come to some this point say this O A when it will come this O A will come here. You will take another point here. Similarly, when it will come to this when theta is equal to 90 degree that is when theta is equal to 90 degree, then your A B is equal to I m. So, take a projection here this is the maximum value. So, if you plot this, if you plot this it graph will come like this. Now when you are going beyond this that is theta you are what you call more than a 90 degree, then again you take the projection, if the point will come here theta is increasing this side this theta is increasing.

Similarly, when it will come here, right; so further when theta is more than 90 degree so, somewhere here; so this point will come here, similarly when it will come here, this point will come here. And finally, when it will come theta is 80 degree again it is 0. And if you take all these point and join it and plot it, it will be a sin curve, right. That is the generation of the sin finally, that O A is rotating. So, it will come to some position here, some position here, this way it will move and it will come to the your what you call? That this is one 80 degree, then this is 270 degree, and when it will come to this one it is 360 degree, right.

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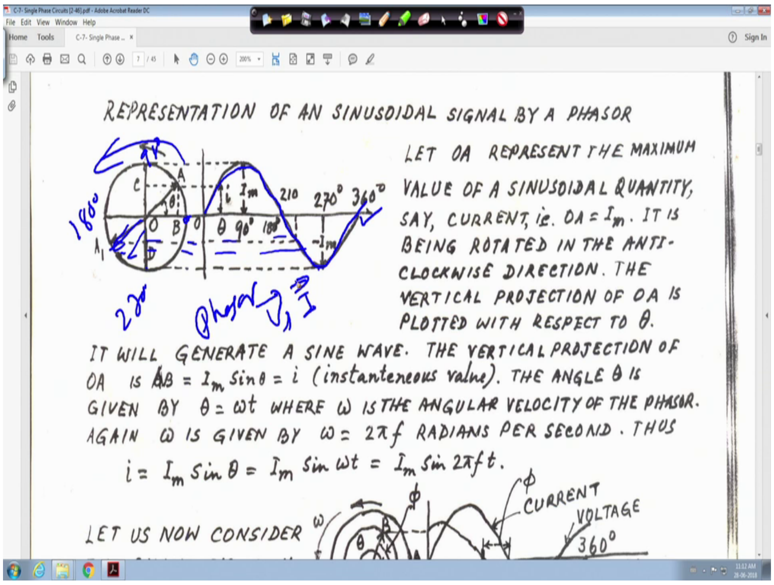

So, it is moving like this. So, let me clear it. So, this is my 90 degree, this is my one 80 degree, and this point is 270 degree. And finally, this point is 360 degree. So, when it is come to this side when your are coming to this side. So, again this value will become negative. So, for this point it will be somewhere here, from this point it will this way it will coming and finally, it up to 360 degree if you do, it will be a sinusoidal what you call generation signal generation, right. That is this that means, this way you take the maximum value of any voltage and current, and then you are moving in the clock anticlockwise direction.

And accordingly theta is increasing theta in between 0 to 360 degree, and if you plot like this and O A and your vertical projection of A B is equal to os sin theta; that is, A B is equal to I m sin theta, and if you take each point and plot it will give you sinusoidal your what you call sinusoidal signal, right. This how that sinusoidal representation of an sinusoidal signal by a phasor; that means, phasor actually phasor is a rotating vector, right. Because angular line between 0 and a 360 degree so, and it is moving your either here we are taking anticlockwise either clockwise or anticlockwise whatsoever the phasor is a rotating vector right.

That means voltage when we write this way suppose V arrow, I arrow this is actually phasor quantity, right.

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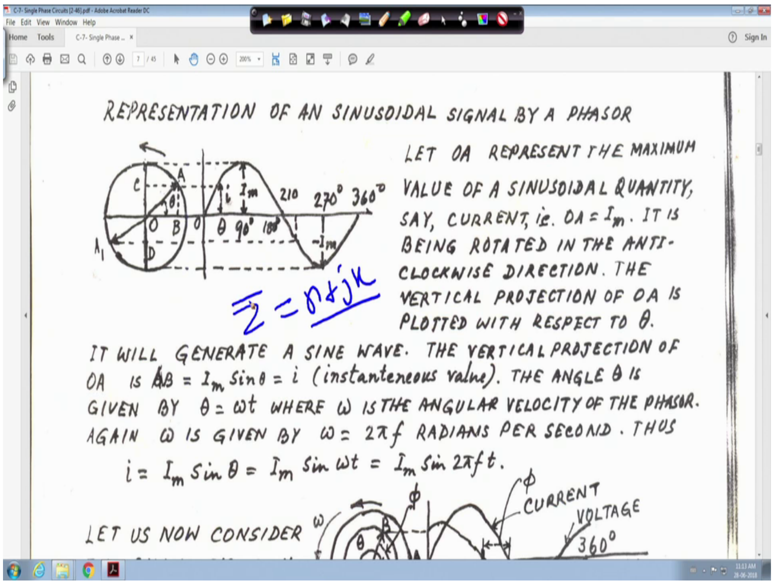

But impedance, let me clear it, but impedance when you write z is equal to later we will see r plus jx, right. So, impedance I just put z bar, right, impedance is not a phasor quantity. We will come to that why it is not a phasor quantity, but voltage and current and phasor quantity, and phasor is a rotating vector, right. So, this is what? That sinusoidal generation and everything is given here omega is equal to 2 pi f. So, it is written I m sin 2 pi f t.

So, alright up here alright up is here for you, but whatever I told this expression in here, right. So, next is that your this one.

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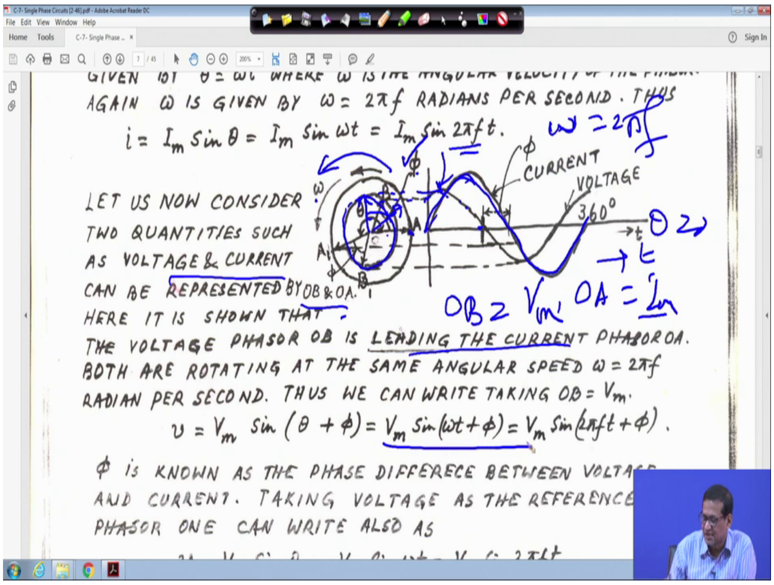

Now, you we have to here also we have to understand certain things. Write up is here that is a different that is that you read later but just listen. Suppose I have a current and a voltage wave form, right. So, for this one what you call this one actually this one, this is a your what you call the voltage wave form.

Now this inner circle this one, right. This is the maximum value of say O B is the maximum value of the voltage magnitude at sometime if; that means, O B is equal to say for example, V m this is the voltage z, right. Forget about scale another thing that is not an issue, thing is that we have to understand. And at that time the current this O A, let O A is equal to at that time current a position was this time, right. And this angle between this voltage and this current, it is phi angle is the phi, right. Now similar way so, I mean this phi this both are rotating in the your what you call in that your anticlockwise direction, right.

That is omega is given, right. So, omega is equal to 2 what you call 2 pi f into t omega sorry, omega is equal to 2 pi f. So, that that is your omega, omega is equal to 2 pi f, right. F is the frequency so; it is rotating in the anticlockwise direction. Now if you take the voltage wave from I mean and current waveform suppose current when current position O A current position was at A and voltage at V and this phi. And they are moving at your what you call in anticlockwise direction, and omega is given that your what you call that as frequency, right.

So, f is the frequency and omega is equal to 2 pi f. So, in that case, as this is moving when; that means, angle between B and A whatever may be the position angle phi will remain constant. For example, suppose if B is somewhere here, and A is somewhere here. This angle phi always remain constant, because both are moving together it is a, right, and in the anticlockwise direction; so because the frequency is same. So, in that case what will happen, and if you make the projection of the voltage from this point, it is some point will be there when it is coming to this one, this is the your what you call this point, and when will come to more than 90 degree it is a peak value V m finally, it will go and come to 0 and again it will move like this.

Similarly, when this your O A is the your what you call I m we have taken. So, at this point, your this is the your what you call that theta is equal to 0, right. So, in that case what will happen? That your this point this point it will start, this point it will start, and in that way that sin your what you call this current wave will be your what you call this sinusoidal one voltage also sinusoidal one, but at theta is equal to this time your t or theta is equal to 0, current waveform will start from there because position is here and voltage will start from here somewhere here, right. So this way, suppose this sinusoidal waveform voltage and current both are generated, but angle between these 2 are remain same.

For example, that just this thing here we have taken the 2 quantities on voltage and current, right. Represented by O B and O A everything is written here, here it is shown that the phasor O B is leading the current phasor diagram that what is the leading or that what does it mean? It mean is a leading or lagging, right. So, in that case what will happen? That if you take that v is equal to, first we have to understand leading and lagging and then will come to this. So, first let me clear it. Now question is that what is leading, and you have to see that out of this 2 wave form which one is reaching it is peak value. Forget about magnitude and another thing which one is reaching it is peak value earlier than the other one.

So, in that case this is the voltage wave form, it is reaching peak value earlier before the current. Because when it is reaching peak value current is here. So, first voltage actually reaching it is peak value before current because current is here. This is one thing or other way that which one is coming to the 0 first the voltage is coming to that what you call the 0 0 first compare to the current, right. So, 2 ways can be done if that out of this 2 wave form in this case that voltage peak is your reaching first then the current peak; that means, voltage actually leading the current. Or other way the voltage actually coming to the 0 first, then the current; that means, voltage is what you call leading what you call leading the current and this angle phi.

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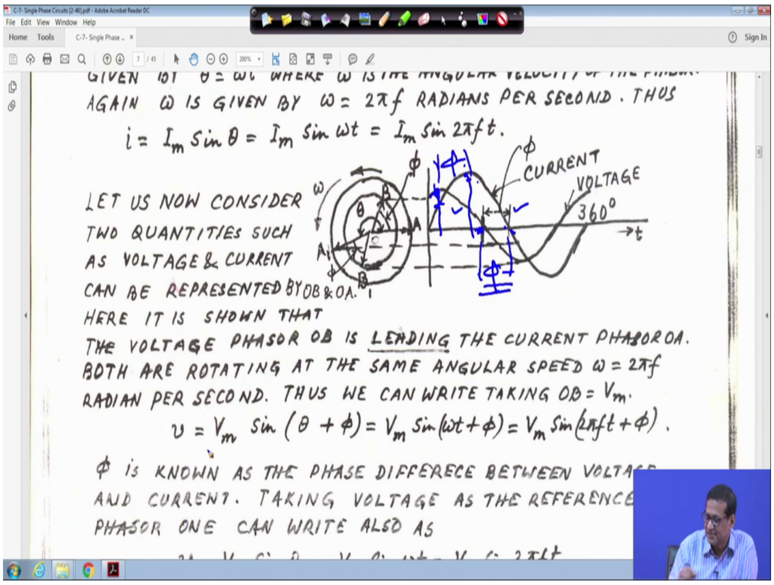

Actually this is the angle phi, right. This is what between this voltage and current, this is angle pi or the peak differences; this angle this difference is phi, right. So, leading means you have a suppose voltage and current waveform. If voltage is reaching it is peak of before then the current; that means, voltage is leading the current right.

Or if voltage is reaching 0 before the current; that means, voltage is leading the your what you call current other way is, other way that current is your reaching peak later than the voltage; that means, current lags from the voltage. Or current reaching to 0 before what you call after your voltage becomes 0 or currents lags from the voltage. So, either this distance is phi or peak to peak this distance is phi. This is the concept of leading or your what you call leading or your what you call lagging concept, right.

So, in this case what will happen? That as voltage is leading by this angle what you call current of phi, right. So, if we take the let me clear, if we take, this is my current signal.

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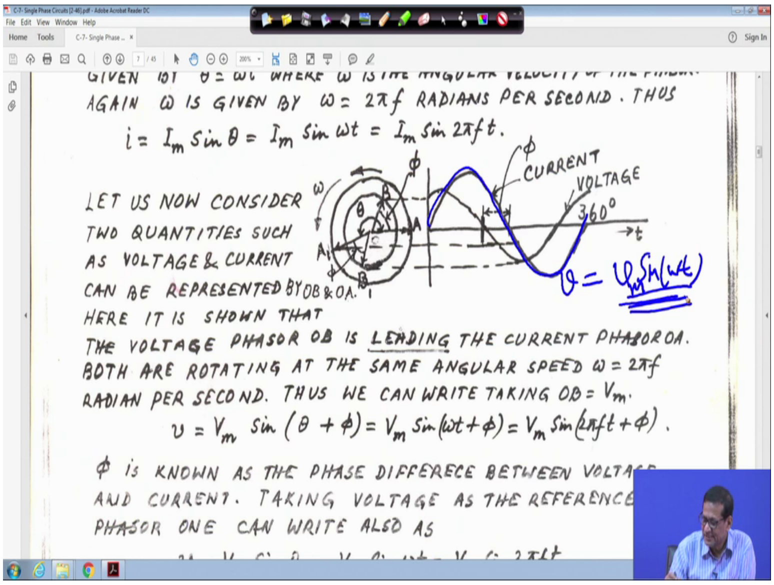

That means my v is equal to, right V m sin omega t, right. This is your this is your what you call this current signal sin omega t, right. And your theta is equal to omega t. So, V m sin sin omega t. Therefore, this is the your what you call that current signal, but in the case of voltage is leading by this angle phi sorry, this is sorry, sorry this is let me clear it.

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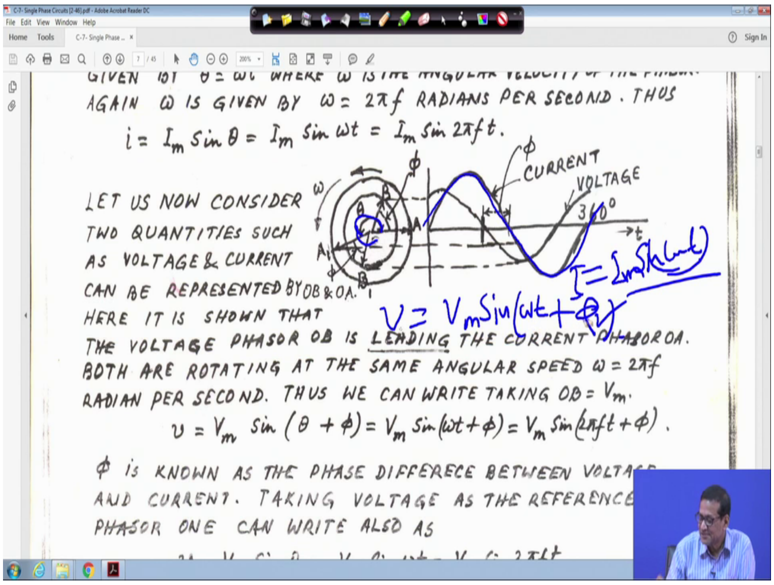

This is not voltage, this is sorry this is current, right. This current I m is equal to I wrote by mistake voltage. So, current is equal to I is equal to I m sin omega t. So, so this is the, this is that your wave form of the current, right. Now voltage case, voltage is leading this current by phi so, voltage case we can write v is equal to V m sin omega t, right plus phi, right, because theta is moving like this from this position to that position. So, it will be sin omega t plus phi, because voltage is leading the current. So, phi angle should be positive, right.

So, we can write V m is equal to sin omega t plus phi.

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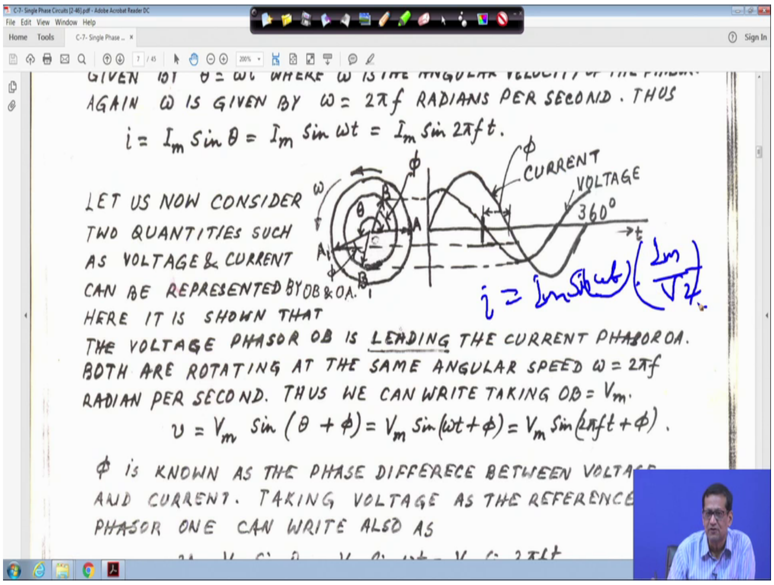

That means, in phasor if you make it like this in phasor suppose we are writing I is equal to I m sin your omega t, right this way writing. So, that means, my rms value is actually I m by root 2, this is the rms value of the current right; that means, when you write this your what you call? This is my rms value; that means, we can write let me clear it.

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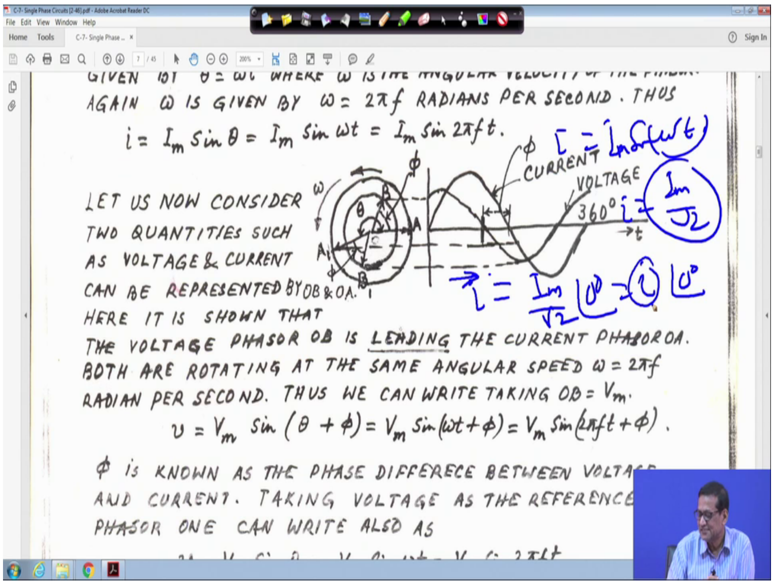

We can write I is equal to say I m by root 2, right. An angle 0 degree, because I is equal to your I m sin omega t no, no nothing is there with that. So, you can write this, whenever we write such thing we write I is equal to I m by root 2 angle 0. And throughout this little bit initially I have made an arrow here. This will represent the phasor quantity is equal to we can write it is I angle 0 degree.

So, no arrow is here means this is the magnitude and this is your rms value; that means, when you write I is equal to I m by root 2 it is rms value, right. We have seen before and it is angle is 0 degree. So, I is equal to say if we write I angle 0 sometimes we are writing small I or capital I it does not matter, this is your I right.

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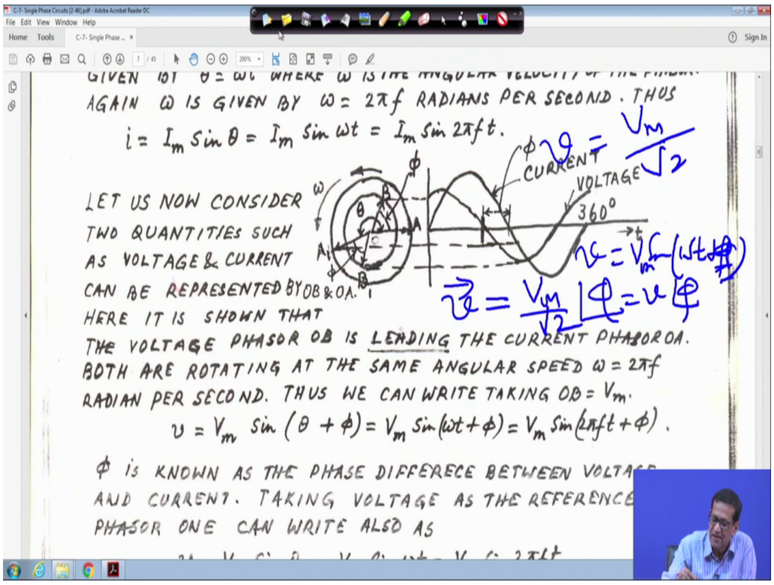

Now, in the case of voltage, voltage we are writing v is equal to V m sin omega t plus phi, right. So, this one we can write in phasor notation say v arrow ok. Arrow means different way it can be represented, but putting arrow v arrow is equal to rms value is V m by root 2, right. Then angle should be your what you call angle should be phi because it is leading by this angle phi. So, angle should be phi. So, that mean this one actually can be written as V angle phi. V is the rms value, but no arrow is here it means rms value magnitude. So, v is equal to V m by root 2, the rms value, right. Whenever we will solve numericals unless and until it is specified we will take the rms value.

So, this is your actually V angle phi, right.

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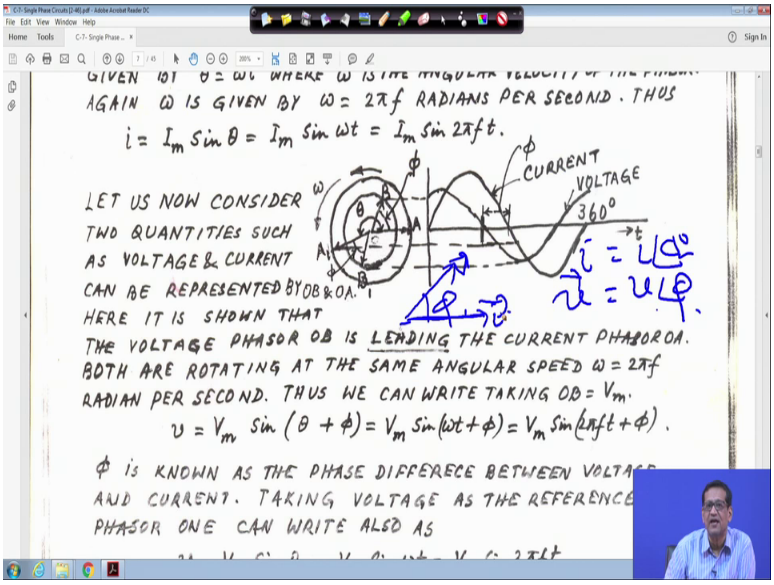

Now question is, let me clear it that means my, I is equal to if it is I, right angle 0 degree. And my v is equal to my V angle phi, than if we plot the phasor diagram (Refer Time: 15:35) of vector diagram, but phasor is a rotating vector that is the only difference you have to see. So, if you draw this so, if we make it suppose this is my, I this is my reference line angle in 0 when this is my, I and this is V angle phi. So, it will be my v, right. And it will be my, I and this angle should be what you call this angle should be phi right; that means, v actually leading the current I by angle phi.

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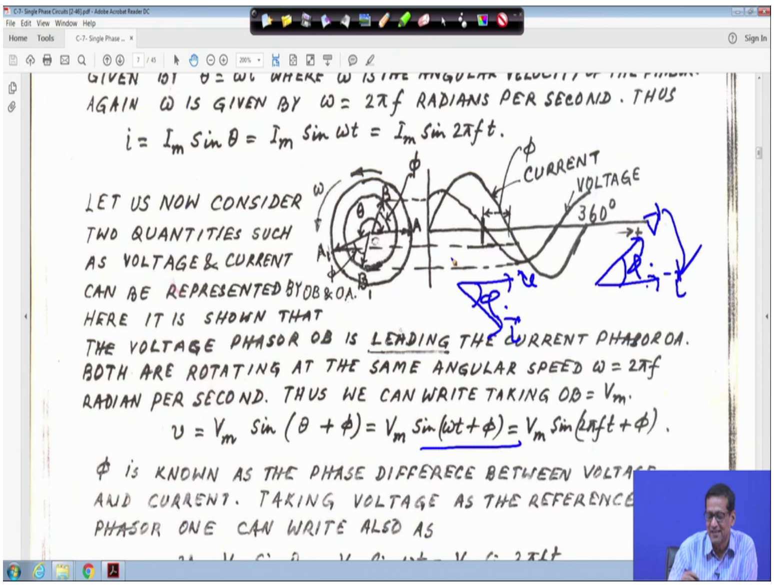

Or other way we can write if you take the v as the reference, let me clear it, otherwise this is my v and this is my, I right.

So, in this case it is also phi. So, same thing say if when you are drawing when we are making this one I and this is my V and this angle is phi, right. So, what we are doing bringing? Your just rotate it this one by angle phi. So, v will come to this and I will move. So, again I is lagging here also I lags V by phi phi degree by an angle phi or v leads I by phi. Same thing here also, v is leading I by phi or I lags from V by phi, right. So, this is the idea of what you call leading and lagging. So, that means, if you have 2 waveforms, you have to see which one is reaching it is first. Peak it reaching it is peak first, that quantity is leading the other quantity.

Or which one is reaching to 0 before the other one that quality leading or vice versa, right. So, this is what all, right up is here I hope you have understood this, right. So, things are very simple looking at the figure this is notes only little bit closely written for next 3, 4, 5 pages. After that I have made it this thing, but everything is everything is written here leading lagging whatever I say everything is written here, right. So, this is the concept for leading or lagging right.

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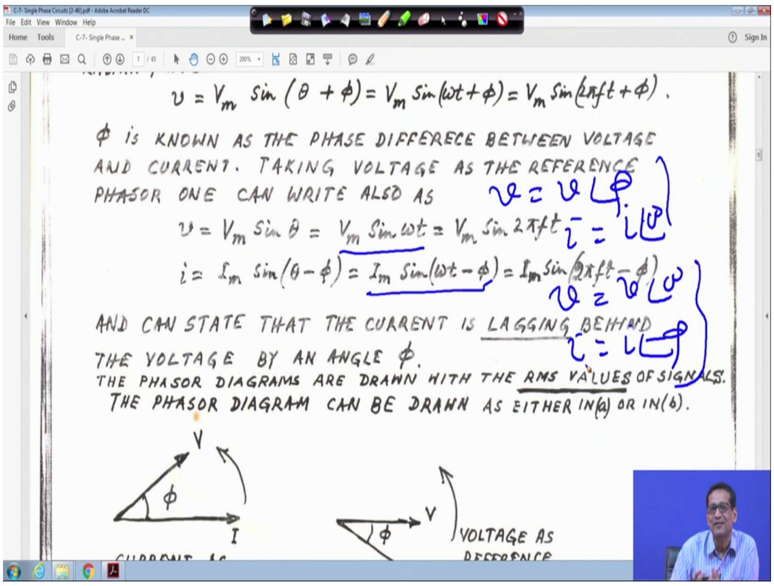

So, that is why that is why here we are making another thing that I mean whatever I told there in this diagram; that means, if we make that it was v is equal to V angle phi and I is equal to I told you I angle 0, right.

So, this will v is leading your what you call leading your I or I lags from V, this one also you can write it, if we take v is equal to V angle 0 reference then I will be your I angle minus phi, right. This thing and these 2 things are same. Here also v if you put same thing it is I angle 0 degree, I lagging from V by phi degree or v leads I by phi degree, here also if v take reference v is leading I by phi degree or I lags from v phi. So, same way it can be written. So, that is why here it is taken V m sin omega t, just for your understanding, in that case, current will be your I m sin omega t minus phi instated of plus phi, right

So, this is the idea of your what you call that leading or lagging concept.

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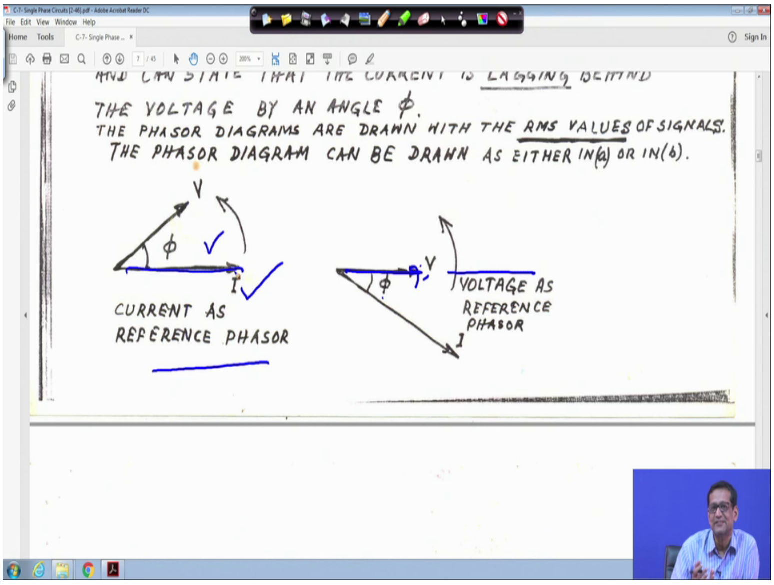

So same thing here; the current as reference phasor I gave you all these thing, there I took small, but here it is taken capital does not matter, right. So, this is V, this is I and this is voltage as reference phasor that here same thing that v is leading I by phi or I lags from V by phi and here also v is leading phi or v or what you call I lags from V by phi angle. This is current as a reference phasor here is voltage that is (Refer Time: 19:02) it is because voltage here is taken as reference phasor.

And here current is taken as a reference phasor, but meaning is same when you will do the numerical also everything will remain same. There will be no change, right. So, this is the concept of lagging and leading of voltage or current, right and generation of sinusoidal waveform.

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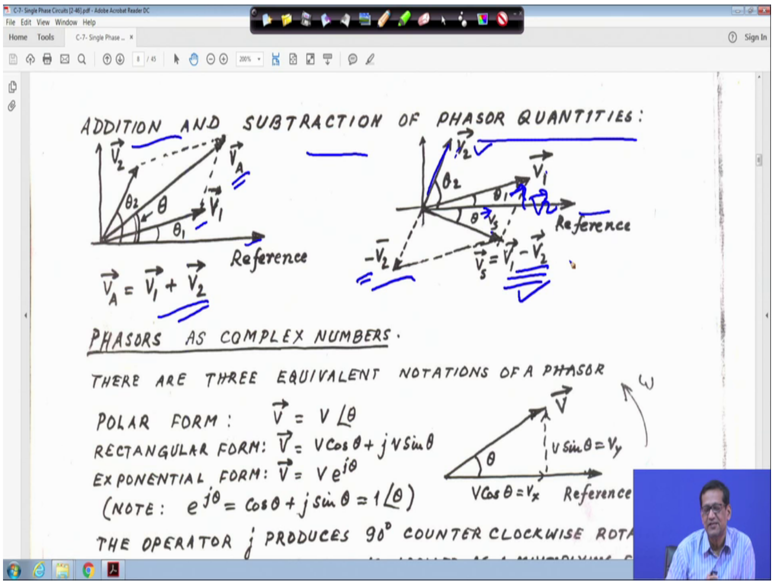

Next now, this is from what you call from your vector your analysis from your (Refer Time: 19:29) physics you know, you know all these things suppose your addition and subtraction of 2 phasor quantities, the way you do vector same way you do here also. Suppose this is my V 1, I want to add this is my V 1, it is the angle theta one and this is by V 2, and angle it is given theta 2. So, v A is equal to V 1 plus V 2 arrow is given to represent it is phasor.

So, and your what you call the way you do in the your what you call that vector analysis in your (Refer Time: 19:59) physics same thing same thing, right. So, similarly and this line is a horizontal line is a reference, here also it is reference, here it is subtraction, right. So, this is what you call my resultant is same, this is v a stands a stands for addition, and here V s stands for your subtraction one arrow is missing, but anyway it is v s, right. So, this is your V 1 and this is your V 2, right.

So, if you want to find out what will be your V s what will be your V s. So, you can easily find out that V s is equal to your V 1 minus what you call V 2, right. So, in this case, 2 way, 1 way it is made if it is V 2, this side will be minus V 2, right? That means, now if you go for phasor sum or now you do vector sum. So, V s will be is equal to your V 1 minus V 2. In other way in other way, if you do this is V 2, and this is also this one also you can take V 2 this parallel to this, right. Therefore, V s equal to V 1 this direction and arrow is here. So, it will be minus V 2 either this way or this way. The way we do same way we can do, right in vector same way we have to done.

But just cannot be algebraic sum, right. It will be phasor sum, we will see that later when we will take the numerical, right.

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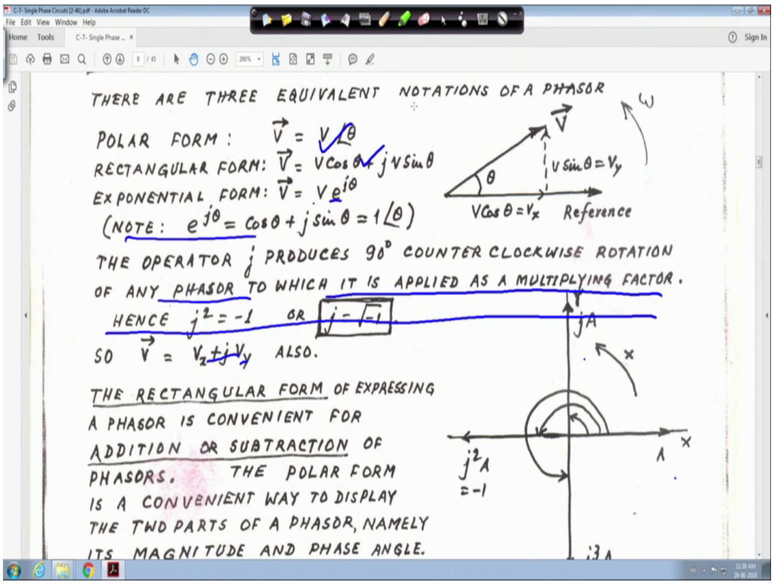

Now phasor as complex number; so there are 3 equivalent notation of a phasor, you know the complex number you have started in your high (Refer Time: 21:30) mathematics, right. So, one way one thing is that polar form, I mean first thing is the polar form if you write v is equal to V angle theta. Here V is the magnitude and theta is the angle, we put we can write the V angle theta right.

Now, in rectangular form, if you write it will be v cos theta plus j v sin theta, right. And, another thing exponential form that V is your arrow you have given, that V e to the power j theta. V is the magnitude e to the e to the power j theta. And e to the power j theta is nothing it is what you call e to the power j theta is equal to cos theta plus j sin theta, right. And it is written here e to the power j theta is equal to cos theta plus j sin theta, then one angle theta that is angle theta basically. So now, another thing is that we will come to that later. So, another thing is that the operator j produces 90-degree counter clockwise rotation, right of any phasor to which it is applied as a multiplying factor.

Actually hence j square is equal to minus 1. So, operator j produces 90-degree counter clockwise rotation of any phasor to which it is applied as a multiplying factor that is; that means, j square is equal to minus 1. So, this is your x. This is real axis, this is imaginary axis, right. So, in that case if this is j this is we call it is imaginary this is j, when you come to this just hold on little bit let me move upward, right; so in this case, in this just hold on. So, in this case, this is j now when you are moving further it is j square, j square is equal to minus 1.

When you will come to this j cube, j cube is equal to minus j. Because this one actually j square into j.

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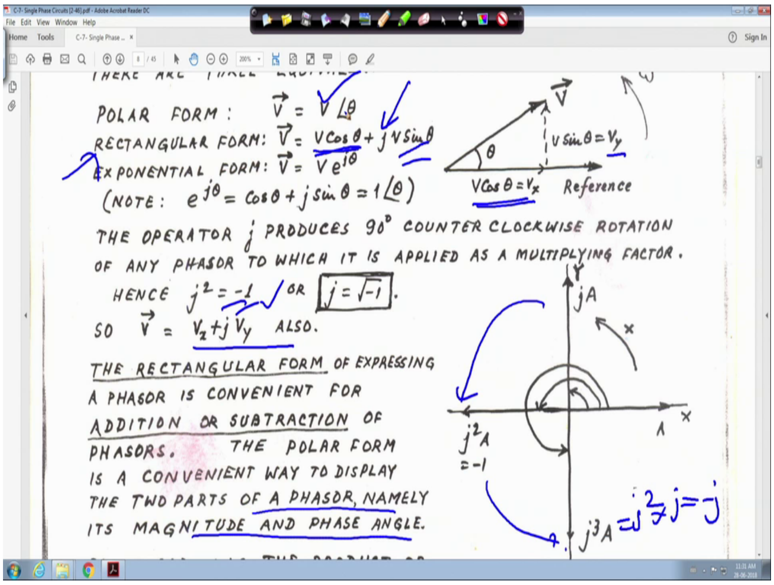

So, j square is equal to minus 1 is your complex quantity. So, that is minus j and when you will finally, you come to this point j to the power 4. So, it will be something like one, right. So, it is moving what you call your counter your what you call anticlockwise direction. So, this is this one, and this v cos theta if you take this is x component is v cos theta. So, v cos theta here is equal say v x, and v sin theta is this one. So, it is this one you take v y is equal to v sin theta, and this is the resultant one v. So, basically v will be your v your v cos theta plus j v sin theta, right.

So, I mean this is your what you call; that means, v is equal to every time arrow and arrow is there, I am not telling it is a understandable is equal to v x plus j V y also, right. So, the rectangular form of expressing a phasor is convenient for addition or subtraction, right. I mean when you make the rectangular form, I mean this form, right. This is a rectangular from this form, because for that addition and subtraction will be helpful, right. That polar form; that means, this one polar form is convenient to a to display 2 parts of a phasor namely it is magnitude and phase angle, because this v is the magnitude an angle I your theta right, magnitude an angle.

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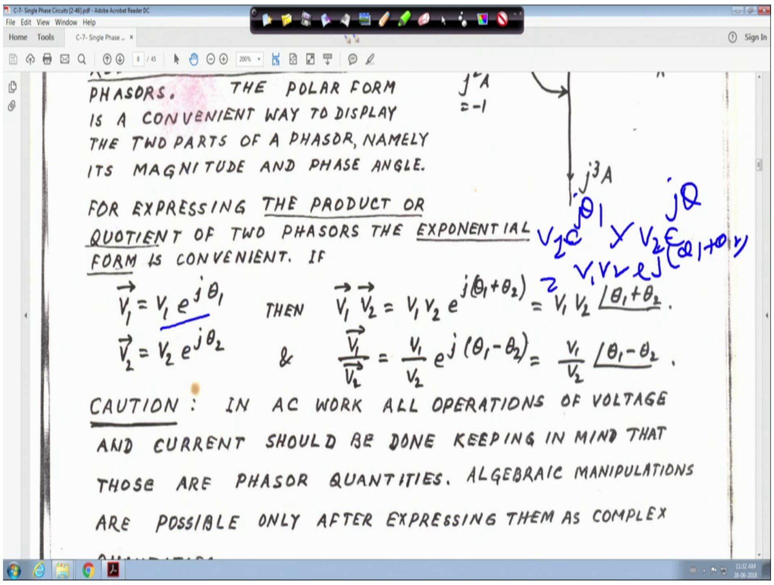

So, let me clear it, right. And from your (Refer Time: 24:48) mathematics, right. You know the operation of complex number, right. So, here suppose V 1 is taken is equal to V 1 e to the power j theta 1 it is V 1 arrow V 2 arrow it is V 2 e to the power j theta 2, then if you multiply this it will be V 1 your I am writing here it if you multiply this it is V 1 e to the power j theta 1 into V 2 e to the power j theta 2, right. So, it actually it is V 1, V 2 and then e to the power j theta 1 plus theta 2, right.

So, that that is actually that is actually what is written here. This one can be written as V 1 angle theta 1 plus theta 2, right.

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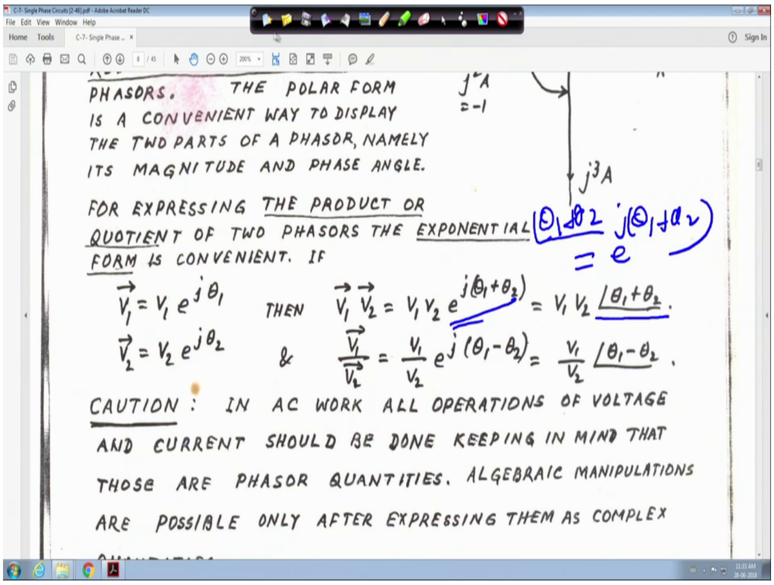

That means any angle theta can be written as e to the power j theta, right. So, here let me clear it. So, here angle theta 1 plus theta 2 is equal to e to the power j theta 1 plus theta 2, right. So, that is here this one is equal to is written as this one right; that means, let me clear it.

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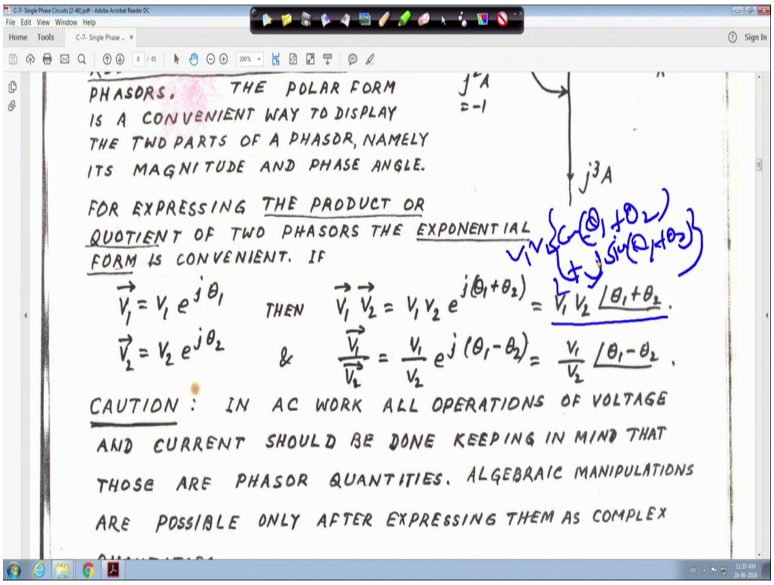

That means this one is equal to V 1 V 2 in bracket I write cos theta one just for your understanding plus j sin theta 1 plus theta 2, right.

So, this one you can write. So, this is actually the way we write V 1 and V 2 are the magnitude, right. And theta one theta 2 are the angles of V 1 and V 2 respectively, right.

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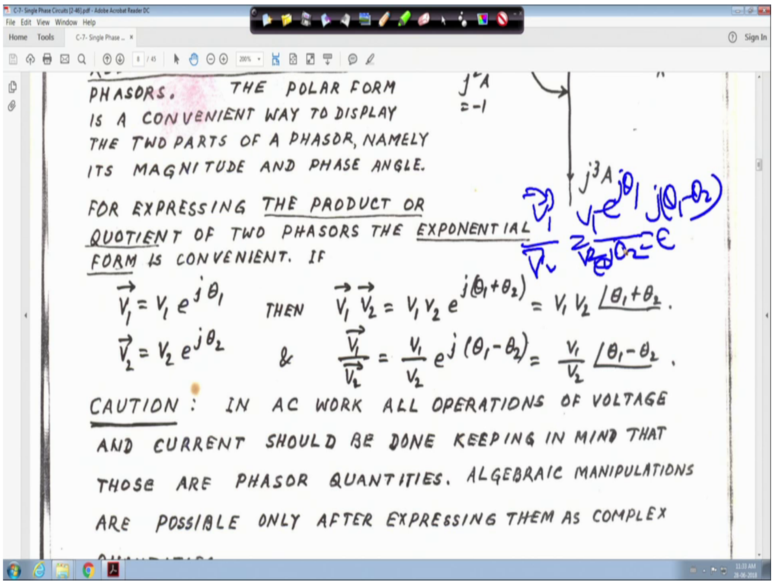

So, similarly let me clear it, similarly V 1 by V 2. So, here I am making it V 1 by V 2. That is e to the power j theta 1 by e to the power j theta 2. So, it is division so, e to the power j theta 1 minus theta 2, right. That is your and it is your V 1 here it is V 2, right. So, that means, it is just hold on that means this one.

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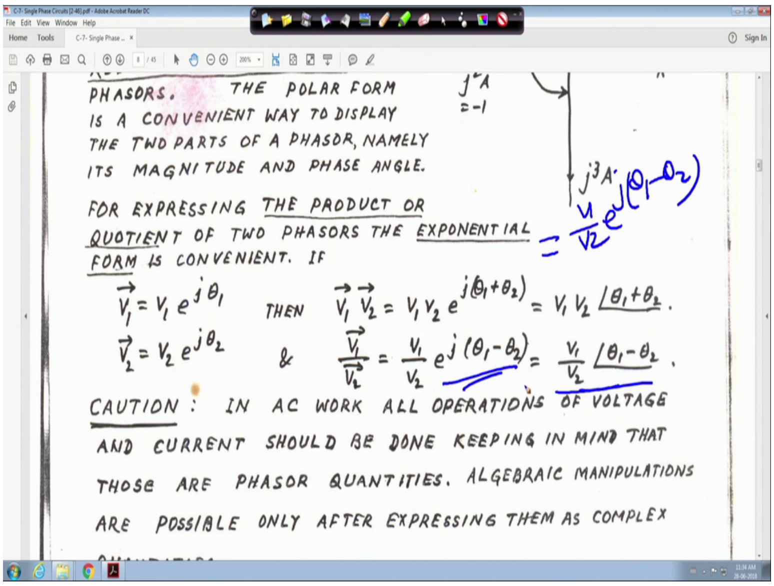

And this one is equal to V 1 by V 2 e to the power j theta 1 minus theta 2. That is what is written here, right. What is written here? And again angle theta 1 minus theta 2; that means, this one it will be V 1 upon V 2 then in bracket cosine of theta 1 minus theta 2 plus j into sin of theta 1 minus theta 2. So, let me clear it.

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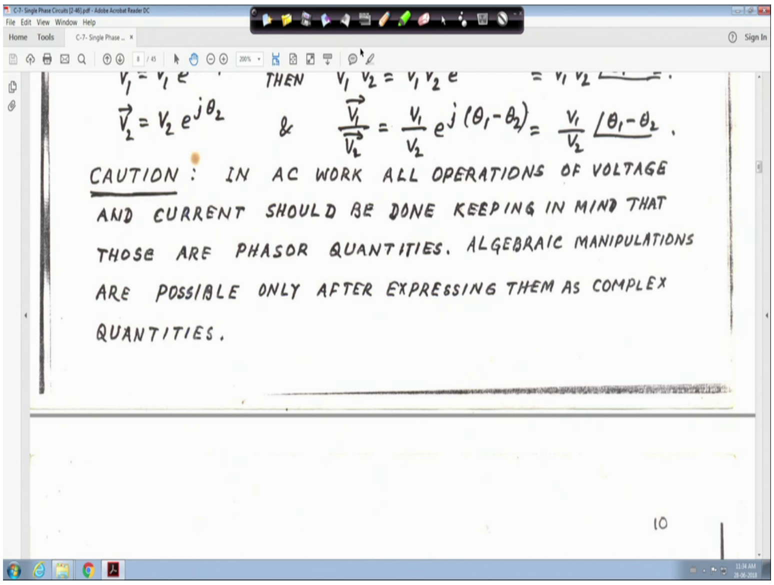

So now some caution I have written some caution is written here. So, in AC, right work all operation of voltage and current should be done keeping in mind that those are phasor quantities. So, algebraic manipulations are possible only after expressing them as complex quantities right.

So, when you will do the calculation be careful about that so, that is all. And next is that for example, that add the following current as wave as phasor, right.

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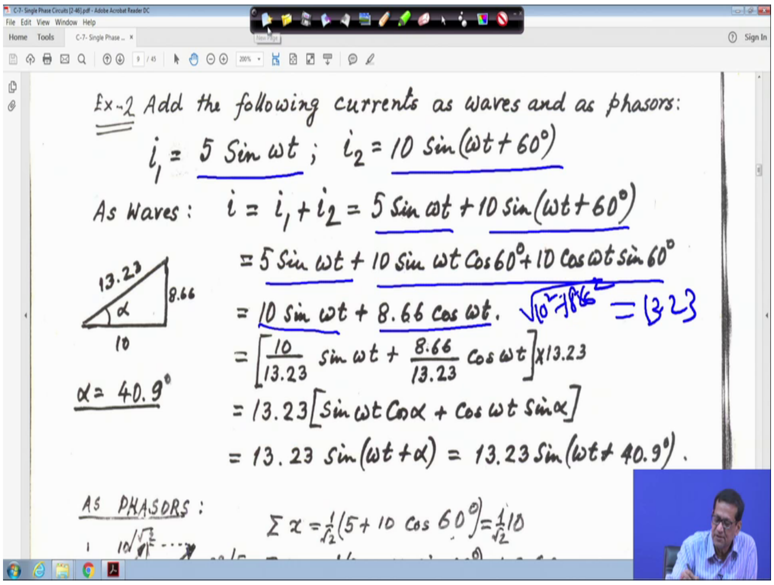

So, in this case i is equal to you have taken 5 sin omega t. And i 2 is equal to 10 sin omega t plus 60 degree. Now if you add ok, right i 1 plus i 2 it will be 5 sin omega t plus 10 sin omega t plus 60 degree. So, 5 sin omega t is there it is 10 sin your sin a cos v cos a sin v you are explained so, it will be this term. So, after simplification you will get it is 10 sin omega t plus 8.66 cos omega t.

Now, you what you will do? This is this actually this one this 10 and 8.6 you find out 10 square root over plus 8.66 square, right that will give 13.23 say, right. So, that then divide this what you call this quantity by 13.23 and multiply.

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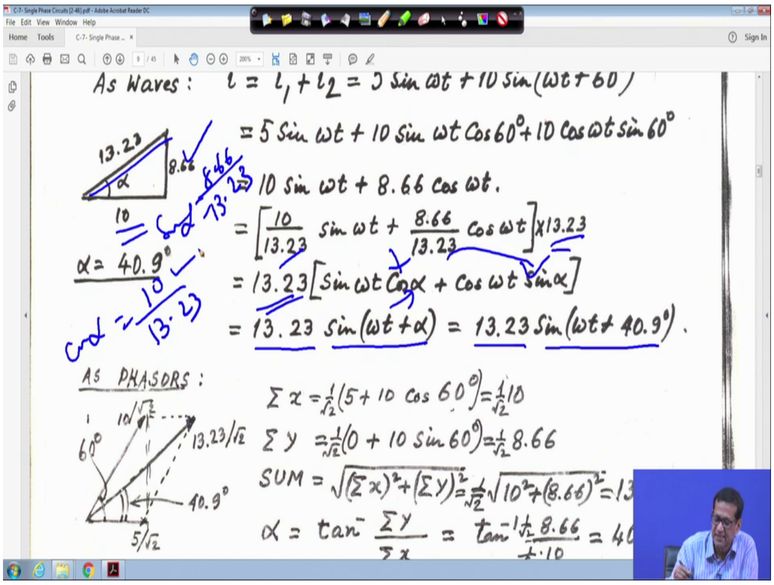

So, if you do so, then this one, if you do so you 10 by 13.23 sin omega t plus 8.66 13.23 cos omega t in to 13.23, right. So, that means, this one is 10 and this one is 8.6. So, this is 13.2 10 this is a alpha; that means, cos alpha is equal to assume that your what you call this 10 by 13.23.

That is why it is written cos alpha. So, I am writing for you cos alpha is equal to 10 by 13.23, right. And sin alpha here I am writing is equal to 8.66 by 13.23. So, that is why here this one is replaced by cos alpha and this one is replaced by sin alpha, right. And this is multiplied by this 13.23. So, it is sin a cos b plus cos a sin b. So, that is 13.23 sin omega t plus alpha, that is 13.23 sin it is 40.9 degree, because if cos alpha is equal to 10 by 13.23 alpha will be 40.9 degree. So, let me clear it. So, this is alpha is equal to 40.9 degree, this is one way.

Now, this is the peak value, this is the peak value say, right. If this is the peak value just let me clear it. So, now this is the peak value. Now this one if you think that your rms value this is the peak value.

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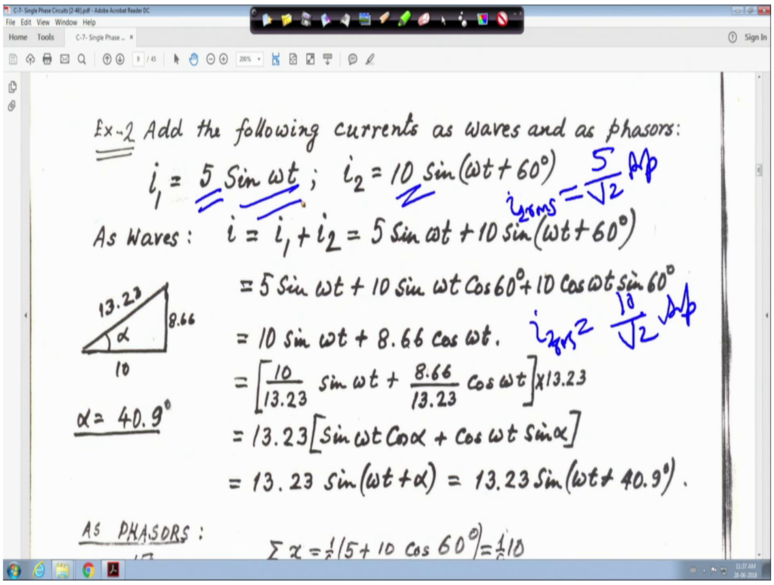

So, when you do it this thing in rms value. So i 1, I am writing for your understanding i 1 rms should be is equal to 5 by root 2 ampere, right. It rms value similarly for this one you do that i 2 should be is equal to it is rms value, for your 10 by root 2 only magnitude you are putting, this is the ampere, right. So, it is 10 by root 2 ampere 5 by root 2 ampere and 10 by root 2 ampere.

Now, in this case this sin omega t means there is no angle associated with that basically it is omega t plus 0 degree right; that means, I can write, let me clear it, that means this one I can write, say i 1 is equal to when you will put rms value 5 by root 2 angle 0 degree, right.

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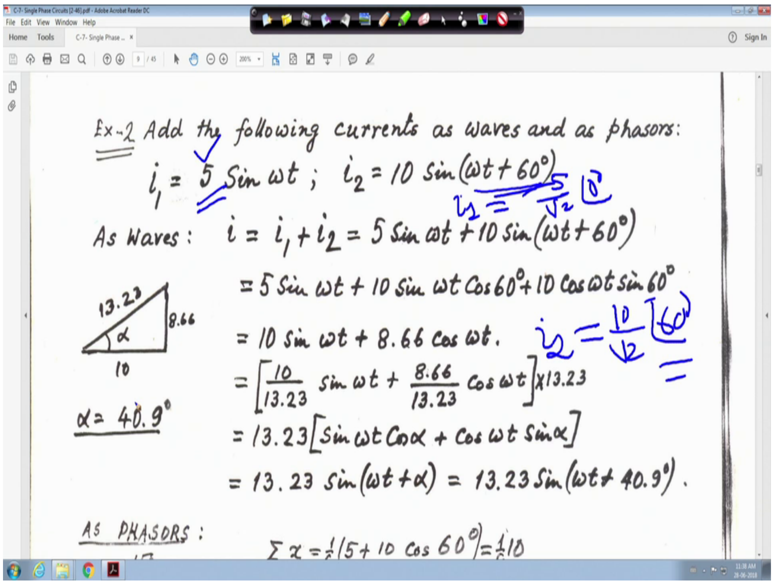

And similarly here angle 60 degree is attached; that means, I can write i 2 is equal to 10 by root 2 angle 60 degree, because 60 degree is there right. That means, this i 2 actually leading i 1 by 60 degree because angle is positive 60 degree right; that means so, this is your how when we will solve the unless and until is stated.

If anything term attached with this sin term; that means, this is a peak value, you have to divided it by root 2 to take the rms value, because on all our calculations will be based on later we will see only on rms value, right.

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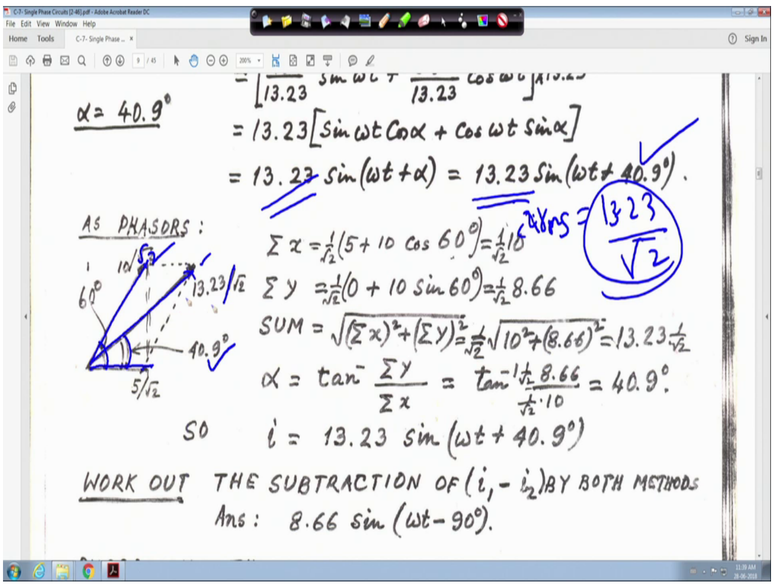

So, in this case, that your this one your this diagram, that is why it is at your i this 5 by root 2 angle 0, that is why it is the reference one, another one I told you 10 by root 2, this one, this is 10 by root 2 and this 60 degree this 60 degree, right. So, another we are getting is. So, it is taken as rms value, and this is resultant one, it is 13.23 this is the 13.23 by root 2.

Because here also it is 13-point root 3 and it is rms value it is rms value actually 13.23 by root 2, right. This is the magnitude, and it is angle is 40.9 degree. So, this angel is 40.9 degree. So, this resultant current actually leading this 1 by your 40.9 degree, and I told you i 2 is leading this angle by your this thing what you call this i 1 by 60 degree, right. This is actually your phasor diagram, this way it is a phasor diagram for this one. Now if you take a projection on the x axis, right. So, it will be this is reference so, 5 by root 2.

Actually everywhere root 2 will come that is why this root 2 is taken outside, right. Plus, this 10 by root 2 root 2 is outside and cosine of your 60-degree cosine of 60 degree. This one and this one this is the x for the (Refer Time: 32:45) projection on x axis, that is 10 by root 2, if you do it. Similarly, for y axis projection it will be 1 by root 2. So, it is it is reference thing. So, it is a projectional y axis is nothing but 0, plus it is 10 sin 60 because this angle is y axis projection is 10 sin 60 that is 8.66 by root 2.

Now, sum if you take resultant will be root over sigma x square plus root over sigma y square. So, that is 1 upon root 2 it will be root over 10 square plus 8.66 square, it will become 13.23 by root 2. Whatever it is written here 13-point root 3 by 2, 2 and alpha will be tan inverse your what you call tan inverse your sigma y upon sigma x. That is tan inverse 8.66 by root 2 by 10 by root 2, right. And that is equal to 40.9 degree.

So, whatever we have got here, right. So, I is equal to similar way the 13.23 sin this is the maximum value 13.23 sin omega t plus 40.9 degree. This is phasor diagram is drawn, that is why rms value is taken, right. For phasor diagram you should take rms value not the maximum value both ways it is solved.

Thank you very much, we will be back again.