Let us do the preliminary calculations there are three zeros in the denominator there are three zeros in the numerator and this one will definitely cancel out with this 3 2 6x4=24, so this is 36 so 36/25 x 75 x ¼ this gives us 3, this gives us 9, 9x3=27 so NA is coming out to be 27 okay. I suspect that the gearbox ratio in the actual problems which I had designed previously it must have been half in that case it would have come out as 54 okay.

But anyway whatever we have started with this thing stands by itself okay the rotations per minute of gear A would be 27, if we take this gear ratio to be 1/4 that is it okay. So even though we are not able to do the problem exactly as stated here but the A box ratio is not mentioned I am sure you have understood this thank you. So let us pass on to another problem.

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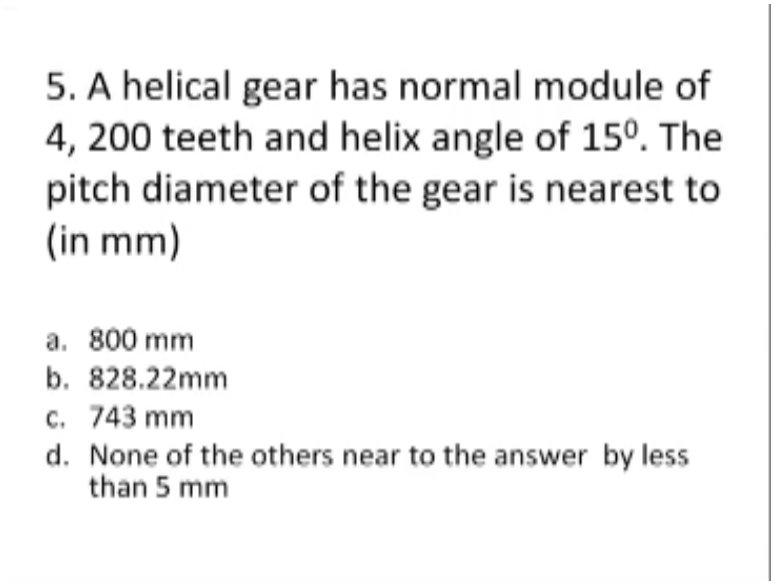

A helical gear has normal modules of 4, 200 teeth and helix angle of 15^0 the pitch diameter of the gear is nearest to in millimeters 800mm 828.22mm 743 millimeters and none of the others are near to the answer by less than 5 millimeters that means none of them are correct basically okay. So let us first see up till now we have been discussing about spur gears now we are talking about helical gears and last in the last lecture we have talked about a problem of this type what was this problem the problem was this that if you have a spur gear with module equal to 4 and feet equal to 200 we can straight away calculate the pitch diameter to be module into the number of teeth equal to 800 in this case let us write down.

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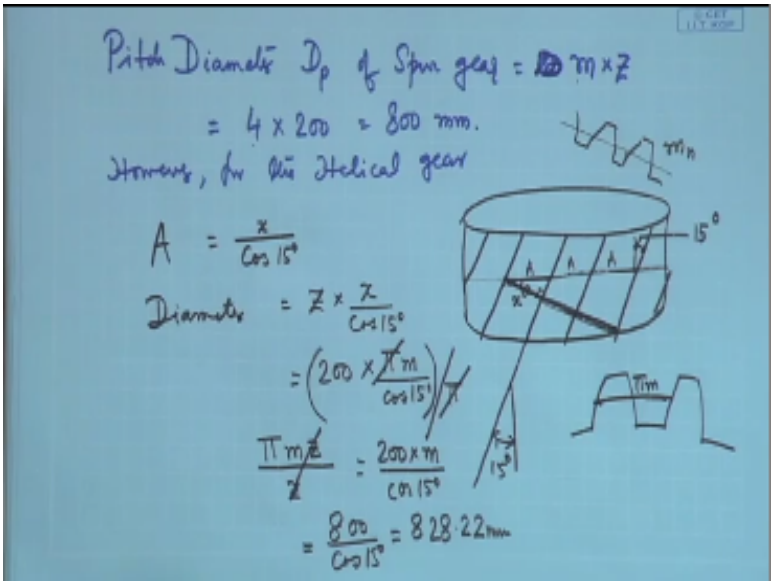

Diameter sorry pitch diameter D_P of spur gear equal to 200 so let us give the symbol first M x Z = 4 x 200 = 800 millimeters, however for the helical gear this is the spur gear yeah the other speed of the helical gear in a helical gear what happens is that this distance taken normal to the tooth orientation this one corresponds to okay, these dimensions if you take a section here it will be coming something like this section if you take it if you cut it along this you will see the teeth this way and this one corresponds to the measurements as per this module.

That is why this is called said to be corresponding to the normal module okay m_n in this direction however it is slightly larger naturally this distance is replaced by this distance if you take a section this way okay. So we are then we are mentioning the school okay we are talking about if you look at the problem once we are talking about normal module, so in the figure coming back to the hand-drawn figure we are talking about this distance these distances they call it on to the normal module okay.

Hence if that is so the diameter which is existing here and because the summation of A, A, A, like that okay it is slightly larger than the you know the distances which are obtained by the calculation of the normal modules. So each of these sections they are replaced like this value and what is this angle if you remember this angle is equal to the helix angle in this case say this is15^0 this angle let me write15^0, so if this is 15^0 this is the right angle and therefore this angle will be 15^0 okay.

This angle will be 15^0 and therefore we find if this is equal to X this one is equal to I mean E is equal to we can write E = X / $\cos 15^0$ right and how many is make up the full diameter if you go fully round as many number of teeth as many a values. So instead of having X values here the diameter is made up of Z x X /cos15 let us replace 200 x now what is this X equal to this X is equal to the distance covered by one tooth okay how much is that? That must be equal to π x M.

So π x M okay divided by $\cos 15^0$ if you find this out okay I think it will be coming out to be 828.22, so please calculate this because the top one just one moment yeah if you look at this figure this distance which we are showing here this distance is nothing but the total okay this total divided by number of P π M Z / 0 is π M, so this thing is equal to the circumference right. So if you divide the circumference by π this cancels out and this becomes equal to 200 into modules by cos15 which is equal to how much is that 800 / $\cos 15^0$.

And that will come out to be 828.22mm, so I hope this is all right this is equal to π x M we go on adding π M divided by power 15^0 Z number of times and we get this value okay. So the answer is 822.22mm, so what we observe is that the pitch diameter of the helical gear is going to have higher diameter than the corresponding spur gear if they have the same normal module.

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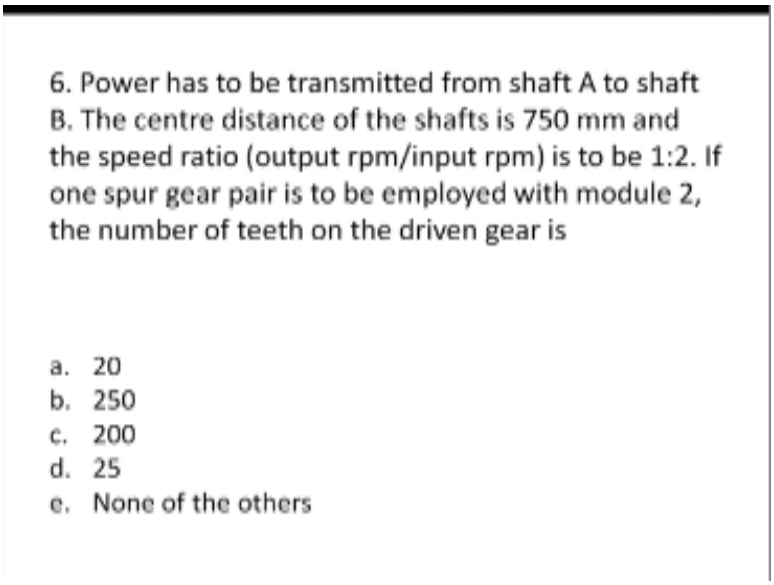

Power has to be transmitted from shaft A to shaft B the center distance of the shaft is 750 millimeters and the speed ratio output by input is to be 1 : 2 that means the speed has to come down to half of its original value is 1 spur gear pair is to be employed with module of 2, the number of teeth on the driven gear is 20, 250, 200, 25 none of the others okay. So let us write out this is the center distance.

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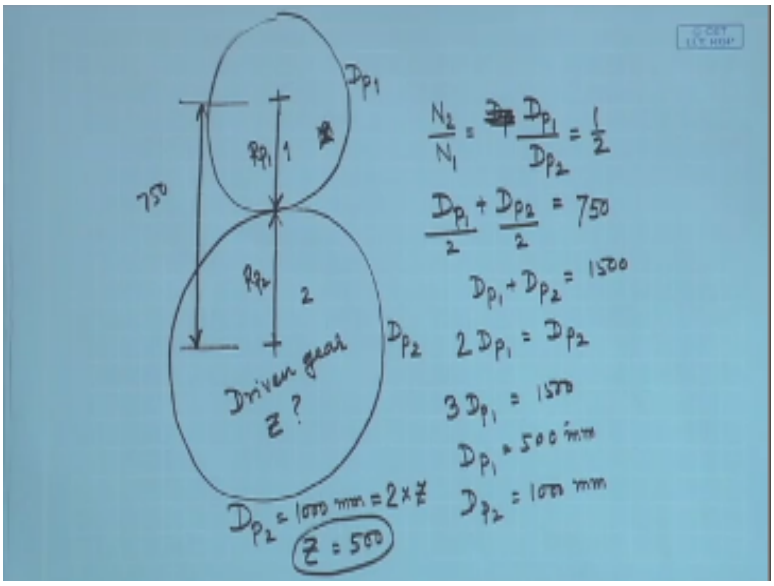

How much is this? This is equal to 750 I have to employ two gears say I positing let me draw them this is one gear and this is another gear I have to employ them what are their diameters do not know but if these are representing the pitch diameter D_{P1} and D_{P2} in that case I can say that definitely the speed ratio N_2 / N_1 - D_{P2} sorry D_{P1} / D_{P2} that means if n_2 is less D_{P1} must be less okay.

So having a how do we get this from the basic definition of pitch diameters we are obtaining this what is $D_{P1} + D_{P2}$ = well $D_{P1} / 2 + D_{P2} / 2$ is simply equal to this distance Plus this distance R_{P2} and $R_{P1,}$ so it must be 750 so we write $D_{P1} / 2 + D_{P2} / 2$ must be equal to 750 that is good what is n_2 / N_1 supposed to be n_2 / N_1 is supposed to be 1/2, so we further get so let us send this to that side $D_{P1} + D_{P2} = 1500$ and D_{P1} = twice $D_{P1} = D_{P2}$ that is good let us replace $D_{P2,}$ so we get price of $D_{P1} = 1500$ therefore $D_{P1} = 500$ and therefore D_{P2} must be equal to how much let us see $D_{P1} = 500$.

So $D_{P2} = 1000$, which means, so the diameter has been found out so let us see what is to be calculated so is this understood that D_{P1} and D_{P2}can be found out from two relations that is the center distance which is equal to the sum of the two radii that is equal to 7 5 750 and D_{P1} / D_{P2} is equal to the ratio of the rotations per minute stated by using those two we have solved D_{P1} and D_{P2} for the question is different.

Let us look at the question if one purl gear pair is to be employed with module 2 the number of teeth on the driven gear is this is the driven gear driven gear is it serving the purpose yes as it is

connected to get a smaller gear if this has rpm X this rpm will be less than X okay, so because its larger in size and it cannot we know their diameter values exactly the diameter will be brought down by a factor of 1/2 okay a factor of two the item will be brought down by a factor of 2.

So everything is satisfied now we have to find out the number of teeth on the driven here number of T, so there has been ½ for so what we can say is that since D_{P2} is known to be thousand millimeters and model is equal to 2 so we can write this must be equal to module 2 multiplied by the number of teeth therefore Z is equal to 500 answer is none of the above why has the given a question in which none of the above is the answer the reason is this very frequently students make a mistake they put $D_{P1} + D_{P2} = 750$ and immediately they will get an answer of 250 they will say yeah 250is there yes and they will stick on 250 okay. This is a trick tricky part of the question yet we extremely alert so answer is none of the others.

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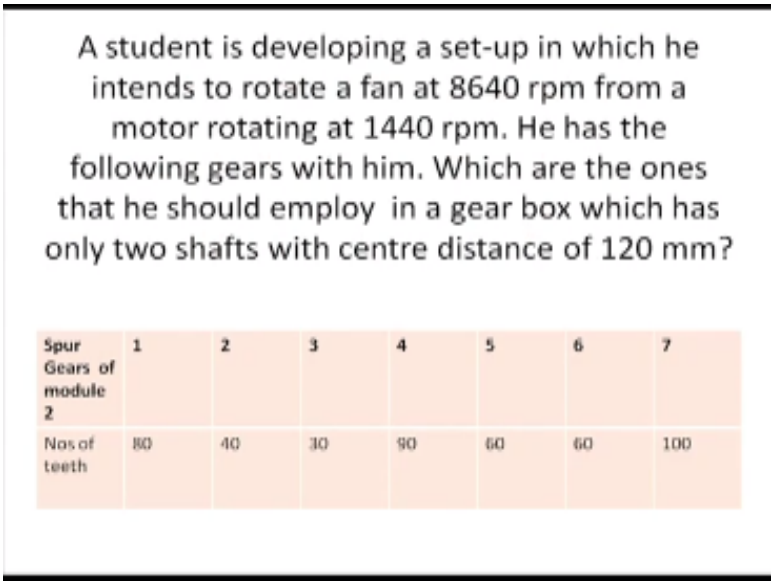

I think we have just a one or two minute so that I will just introduce this problem and ask you to solve yourselves and I will provide the answer in one of the subsequent lectures and if time is it I will discuss it ourselves a student is developing a setup in which he intends to rotate a fan at 8640 rpm from a motor rotating in 1440rpm okay. So almost six times the argument has to increase here the following gears within which are the ones that we should employ in a gearbox which has only two shafts with center distance of 240 millimeters. So let us have a look at the figure.

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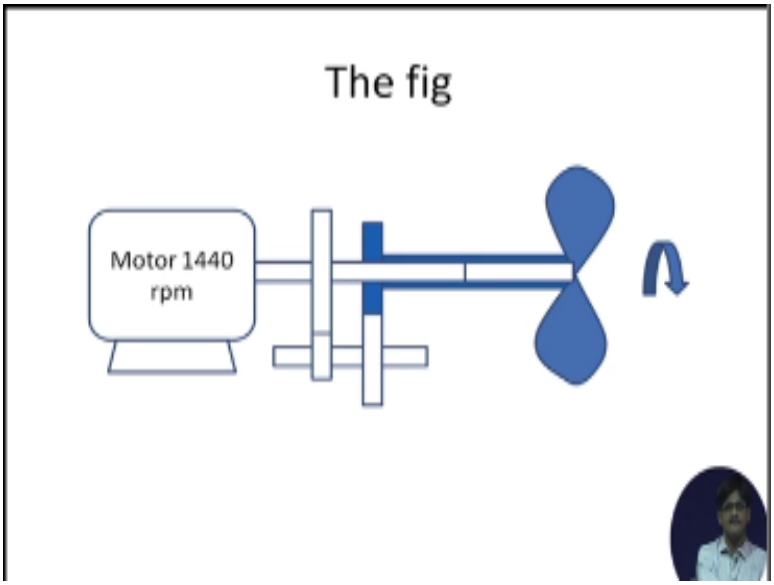

This is the proposed figure motor 140 rpm gear with it gear to a you know auxiliary shaft and this one sharing rpm giving it to another gear which is loosely fitted on the first gear not rotating and not having any rotational relation with the first gear first kept and this one is connected with the fan, so with only two shafts we are able to bring down the RPM once here and once there so what should be the answer okay you can think about this we will discuss the answer in one of the subsequent lectures. Thank you very much.