So let us first of all, so before going into further calculations for the calculations are required let us finish up the introduction to gears. That is okay we understand now we have a rough idea of what our gear and how they operate etcetera but let us in the introduction let us also established why do we need them? Why do we need gears? So for that we can identify with the help of gears we can transmit all from 1 shaft to another.

So that means if there is a question of you know some space existing between the source of power and the point of application of ultimate point of application, of power and if there is a gap you can transmit the power with the help of gears, from this shaft to that shaft and maybe there will be intermediate shafts also. Second we can obtain different rotational speeds on an output shaft from an input rotating shaft.

So if there are 2 shafts and suppose you have thousand rpm on the input shaft and someone asks you get input power get the input power to drive the output shaft at 500 rpm. Mind you from 1000 rpm in on the input shaft you have to have 500 rpm on the output shaft, so if you use gears in that is it possible to drive the output shaft and this particular rpm. So in addition to transmission of power from 1 shaft to another you can also dictate the rotational speed of the output shaft provided the input shaft is having a definite rpm.

Have different torque and handling capacities, so on a particular shaft you can have different dog handling capacities that means if the output required output torque varies, okay you can make use of gears or gearboxes to handle that torque. That means that if the torque becomes very high so that you find initially that you cannot rotate that shaft you can have an intermediate gear box which will allow you to you know overcome that output required output torque and make the shaft rotate.

Second I next rotational motion to linear motion, let me give you an example by drawing a figure okay.

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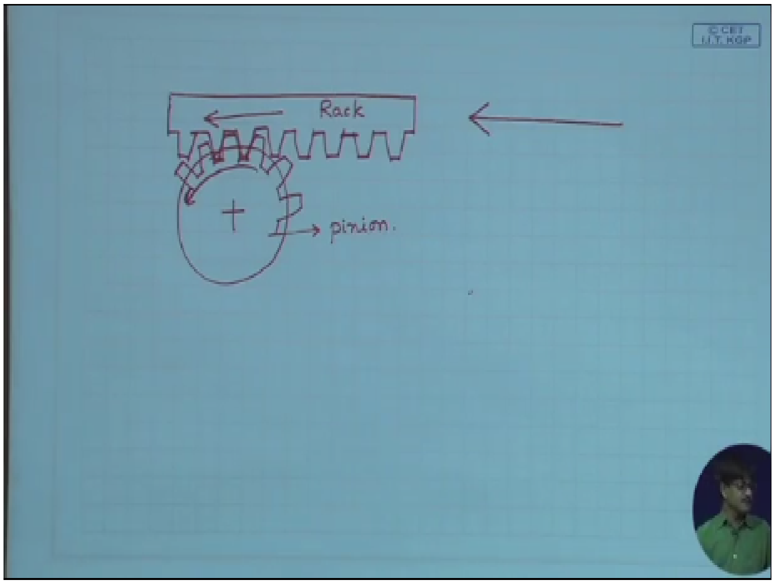

I have rotational motion here and I have put a wheel here, this is rotating about this axis of rotation and I have teeth on this, so I have already put a gear on top of this rotating shaft and someone asks me to have linear motion like this. How can I do that? So for that one particular example is that I can have something called a rack a straight-sided gear. You heard of the term rack and pinion, so we are basically discussing that particular machine element pair the pinion is the circular gear.

Pinion means a small gear in pair with a larger gear so it can also be rack and pinion, so this one we are calling the rack and this one we are calling the pinion. So if this rotates this will move towards this side alright, so with the help of this mechanism which is basically a gear pair we can have rotational motion getting converted to straight-line motion. So naturally if you are able to convert straight-line motion actually rotational motion to straight-line motion you can also convert straight-line motion to rotational motion.

This is also possible, so coming back to our discussion we can easily identify these uses of years and many more. We have not mentioned so many other functions of years that we might be having but these are you know quite simple examples very generic to make us realize, that yes years are very much essential. Archer this one we have already established, so let us have a quick look at some numerical problems. It will be very interesting to discuss 1 or 2 numerical problems.

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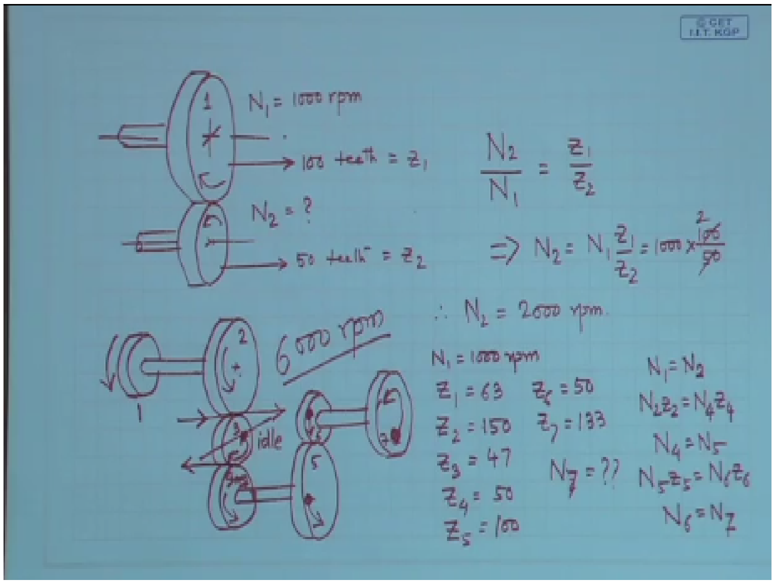

For example say I have problem that we were dealing with this year is rotating this shaft is rotating at, say let us call it 1 N1 = 1000 rpm and here we have another gear which is rotating at okay, this is N2. I do not know what is N2? But I have been told that this has, just a moment just a moment this has 100 teeth. This is 100 teeth and say this one has 50 teeth, so what is given and 1 is given Z 1 is given, so this is Z 1 N 2 is not given and Z 2 is given.

So find out n2, so we can say the answer is N 2 / N1 being = Z 1 / Z 2 N2 is N1xZ 1 / Z 2 = N 1 is 1000 and Z 2 is 50, so we have a 2 here therefore N 2 is = 2,000 rpm okay, so this is quite simple to understand if I have to give like this if I am given three values in that case I can easily solve for the last value of the four. Let us have another example sorry that is it this looks quite impressive 1 2 3 4 5 6 7 and suppose this is the data that I am providing you N1 is = once again a 1000 rpm Z1 = say how many 63, that means the number of feet on here 1 is 63 Z2 = 150 Z3 = 47, Z4 = 50, Z 5= Z 5 100, Z 6 = 50, and well Z 7 = 133.

Find out N7 find out N7, now first of all we should look at the problem this way, that what are we supposed to find out? This rotational speed so this rotational speed we are given N1 so this 1 rotates this rotates that okay, rotates this rotates this etc. N7 has to be found out so first of all what we should establish is this N1=N2. First these 2 rotation speeds are the same and whatever the number of teeth on 1 it is absolutely you know not relevant to this problem.

It can have any number of T so N1 = N2 that 1 is not required. Next we understand that the rotational speed sorry the tangential velocity at the periphery and at the pitch circle of 2 this velocity must be =, so sorry I think I made a mistake here this rotates this way though this rotates this way, I am sorry so this velocity let us draw it properly this velocity and this velocity the other thing this velocity and this velocity they are the same.

And therefore we can totally drop this 1 from calculations, that into a fine line to understand this is not required it is called I do gear what is its purpose? It does have a purpose it does not affect the rotational speed ratio but it will be affecting the direction of rotation. So if it is rotating this way this also will be rotating this way, please understand that the rotational direction that I gave previously was wrong, so this is this way this is this way and this is therefore this is rotating this way okay.

So since this velocity and this velocity are the same we can establish the same relation between these 2, so first of all we can write thatN 2 then Z2 =N 3 is Z4 N 4 red 4. Next we again find out that this is since this is a rigid body with same rotational speed also so N 4 = 5 and 4 = N5. Next if N5 and N6 I mean if gear N 5 and Z5 number N6 Z6. And naturally N 6 is = N 7that is it with this sort of relational ship conditions we can find out by solving these equations.

Now is it really you know painstaking you have to go through this 1 once your experience with this and once you find out that the angles a number of teeth that I have given they are very simple values, you can quickly calculate as well okay 1000 rpm, you say thousand rpm okay 1000 rpm what is the number of teeth ratio like in Z 2 and then for Z 2 and Z 4. So the number of feed is becoming 1/3 so the speed must be becoming triple so 1000 rpm 3000 rpm 3000 rpm Z5 =100 and thatZ6=50. So again it becomes double 6000 rpm, so answer is 6,000 rpm 6000 rpm so we this we come to the end of our first lecture thank you very much.