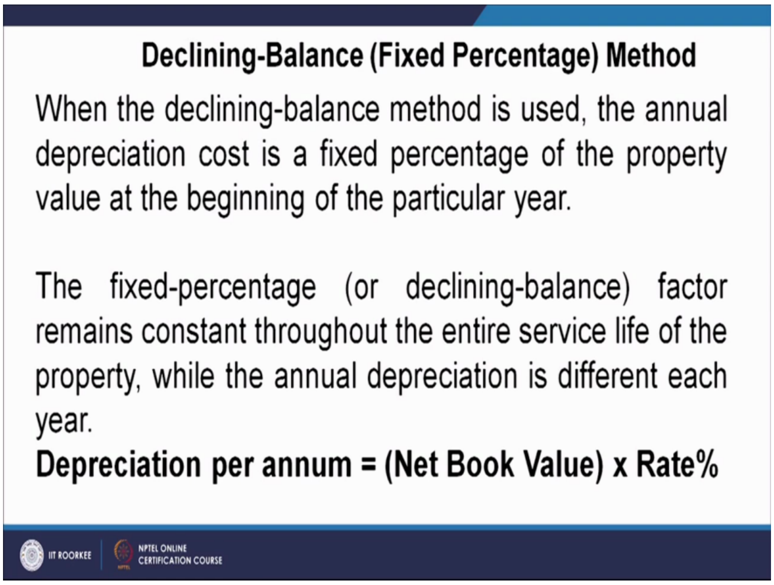
Depreciation, Alternate Investment and Profitability Analysis.
Professor Dr. Bikash Mohanty.
Department of Chemical Engineering.
Indian Institute of Technology, Roorkee.
Lecture-3.
Declining Balance Method.

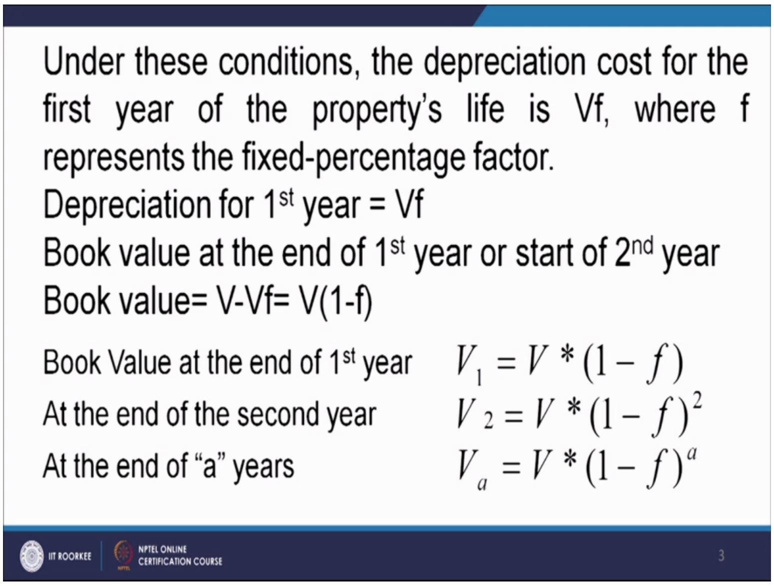
(Refer Slide Time: 0:50)



Welcome to the course depreciation, alternate investment and profitability analysis, we are continuing with module one that is depreciation. The topic of today's lecture is declining-balance method, this is a depreciation method. When the declining-balance method is used, the annual depreciation cost is a fixed percentage of the property value at the beginning of the particular year.

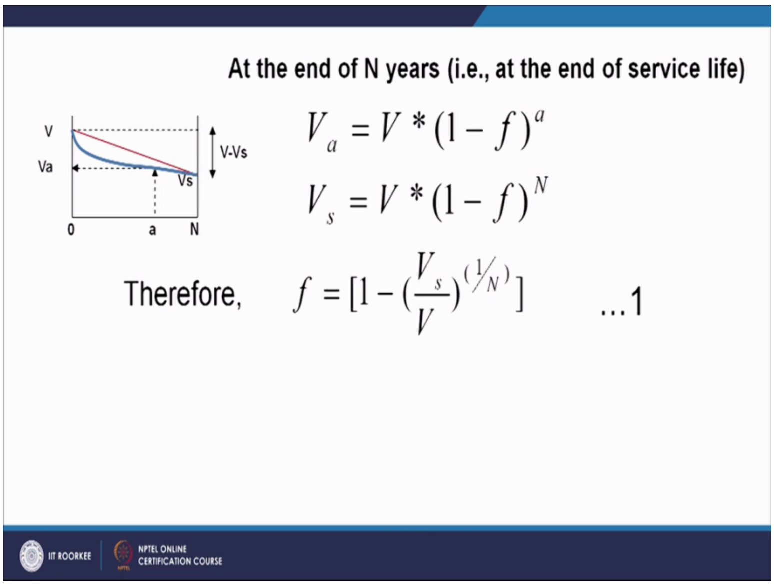
The fixed percentage or declining-balance factor remains constant through the entire service life of the property, while the annual depreciation is different in each year. The depreciation per annum is equal to net book value into a constant percentage which is given here by rate percent.

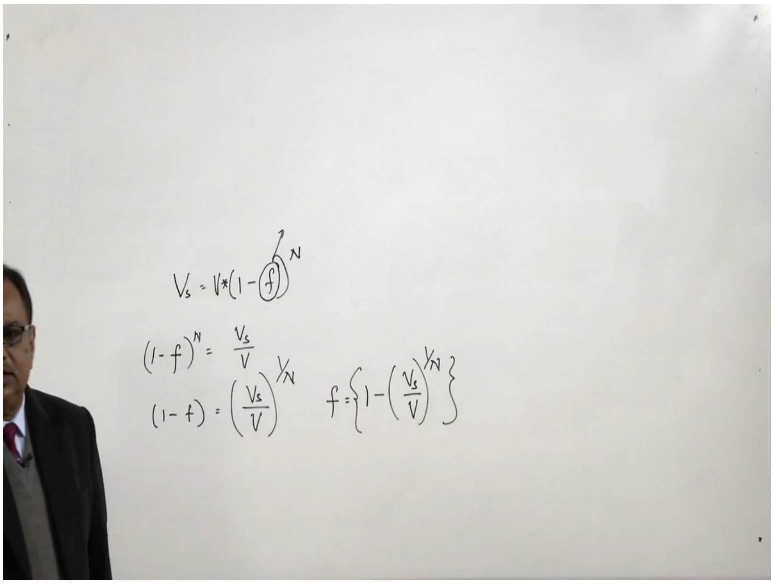
(Refer Slide Time: 1:57)



Under these conditions, the depreciation cost for the first year of the property life is V into f, where f represents the fixed percentage factor. So, we can write down the depreciation for first year is V into f and the book value at the end of the first year or we can say the start of the second year is equal to book value is equal to V - V into f. If we take V common, this is V in the brackets 1 - f. Book Value at the end of the first year is V1, if we consider it to be V1, this is equal to V into 1 - f, at the end of the second year if I consider it to be V2 then it is V into 1 - f whole square and at the end of the 'a' th year, this is Va is equal to V into 1 - f to the power a.

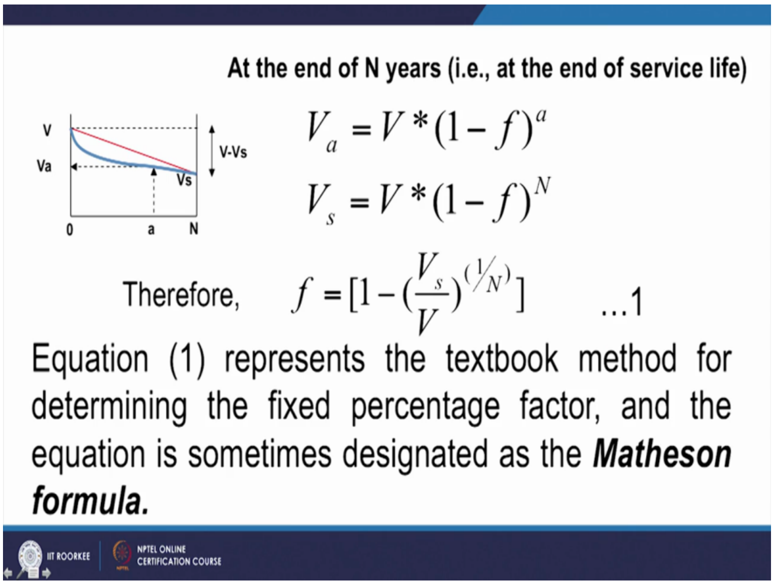
(Refer Slide Time: 3:17)





Now, at the end of the N th year this is obviously, at the end of the N th year the value becomes Vs that is salvage value and we can write down Vs is equal to V into 1 - f to the power N. So, we can write down here, Vs is equal to V into 1 - f to the power N. now, if this f, the fix factor is unknown. So, from this equation, we can find out this fix factor and this fix factor is f 1 - f to the power N is equal to Vs by V or 1 - f is equal to Vs by V to the power 1 by N or f is equal to 1 - Vs by V to the power 1 - N.

(Refer Slide Time: 4:39)

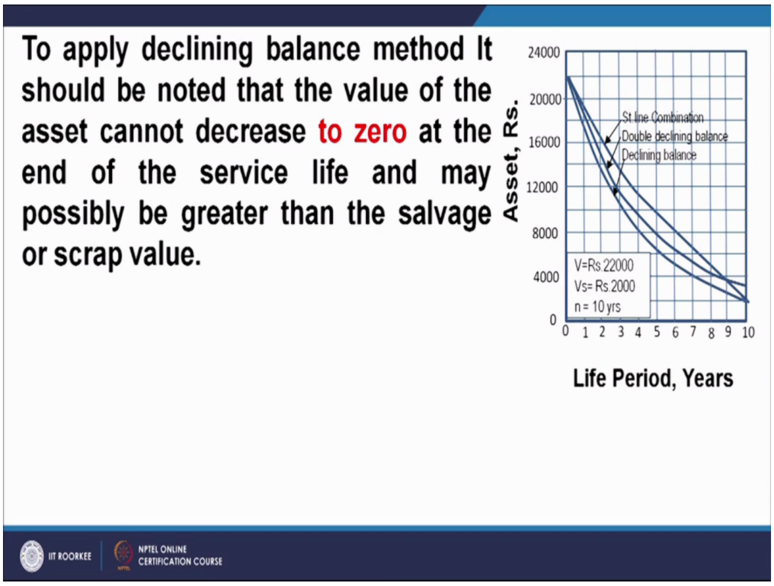


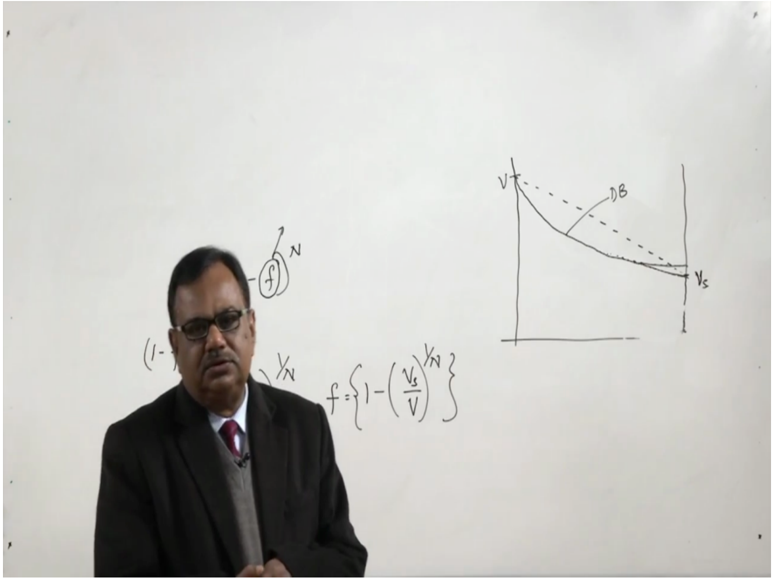
Now, this is the equation to find out, the value of the fixed factor f. Now, we will see that, the depreciation rate is not constant in this declining-balance as shown in the left hand side figure, the depreciation is more, during the, in the straight line this is something like this, and the declining-balance, this is something like this, this is declining-balance. This equation which is equation number one, represents the textbook method for determination of the fixed percentage factor and the equation is sometimes designated as the Matheson formula. Comparison with the straight line method shows that declining-balance depreciation permits the investment to be paid of more rapidly during the early years of the life.

Declining balance method is appropriate where an asset has a higher usage in the early years of its life. For instance, computers and its accessories have better usage in the early years, these also becomes absolute in a span of few years due to advent of new technologies. Use of declining-balance method to depreciate computer equipment would ensure higher depreciation in the early years of its operation.

The increased depreciation cost in the early years are very attractive to concerns just in starting phase of business, why? At the starting phase of business, the company has put a lot of money into the business and it is always short of money, but during that period at the starting phase if it pays more tax or returns the money, more money in terms of tax then it will overload the business. Because the income tax load reduced at the time when it is most necessary to keep all pay out cost at a minimum and this is why if the depreciation cost in the early ages are more than one have to pay less income tax in early ages and for this purpose, declining-balance method is good.

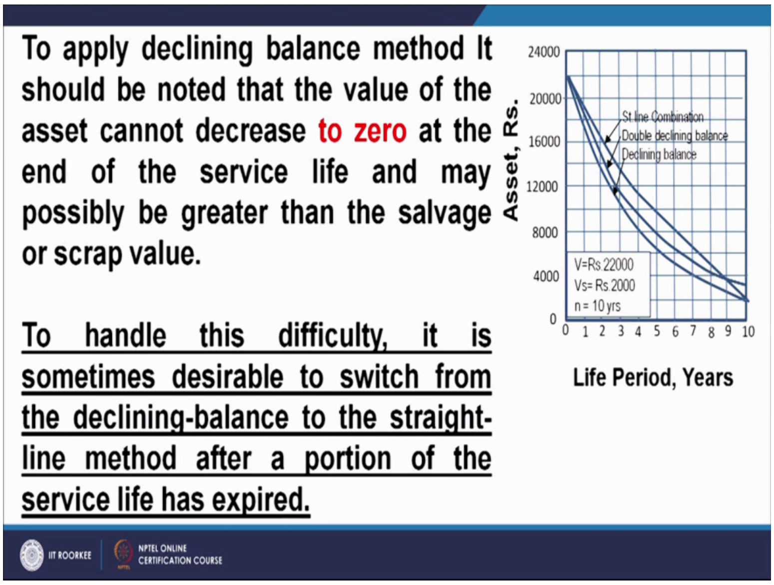
(Refer Slide Time: 8:04)

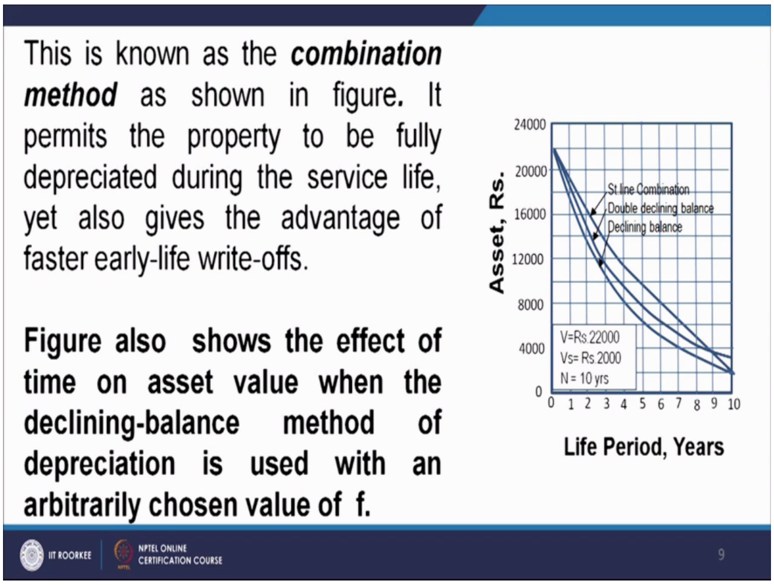




To apply declining-balance method, it should be noted that the value of the asset cannot decrease to zero at the end of the service life and may possibly be greater than the salvage value or the scrap value. Let me explain this, if I am using, declining-balance method, this is my Vs point, it may reduce to a value which is greater than previous and hence, what is being done after some period of time, one switches to straight line method of depreciation to bring the salvage value to its original value.

(Refer Slide Time: 9:15)

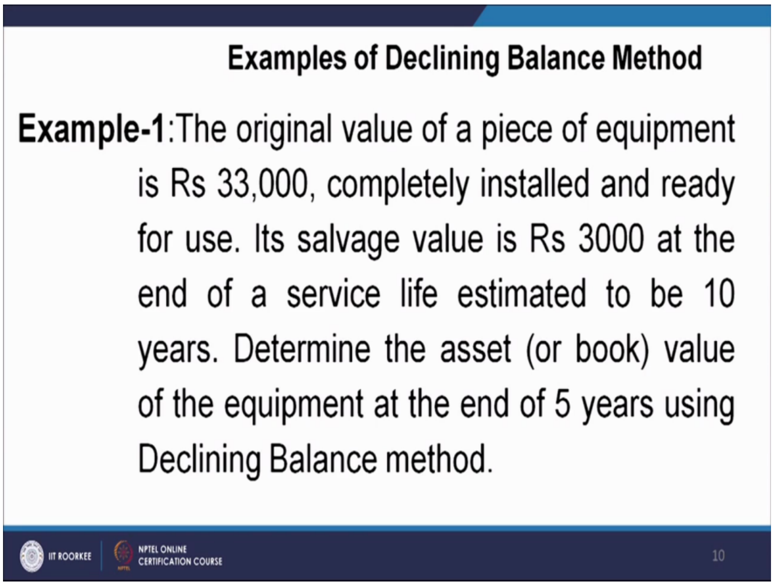


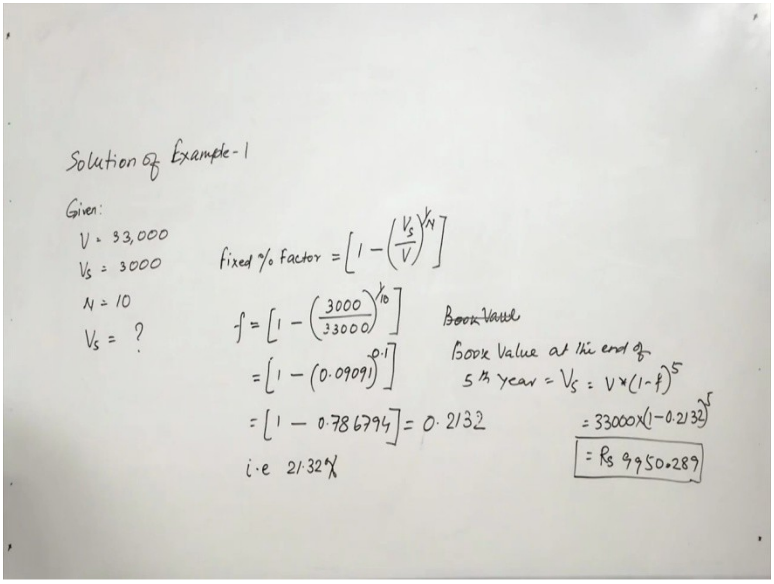


To handle this difficulty, it is sometimes desirable to switch from the declining-balance to a straight line method as I have done this here, I have switched declining-balance method to straight line method here, switch from the declining-balance to the straight-line method after a portion of the service has expired. This is known as the combination method, as shown in the figure, in the right hand side, it permits the property to be fully depreciated during the service life yet also gives the advantage of faster early-life write-offs.

So, the both properties are combined when I am using a combination method that means, the first recovery in the early period and then reaching to the Vs in the later period when I am using a straight-line method. The figure in the right hand side also, shows, the effect of time on asset value when the declining-balance method of depreciation is used with an arbitrarily chosen value of f.

(Refer Slide Time: 10:54)





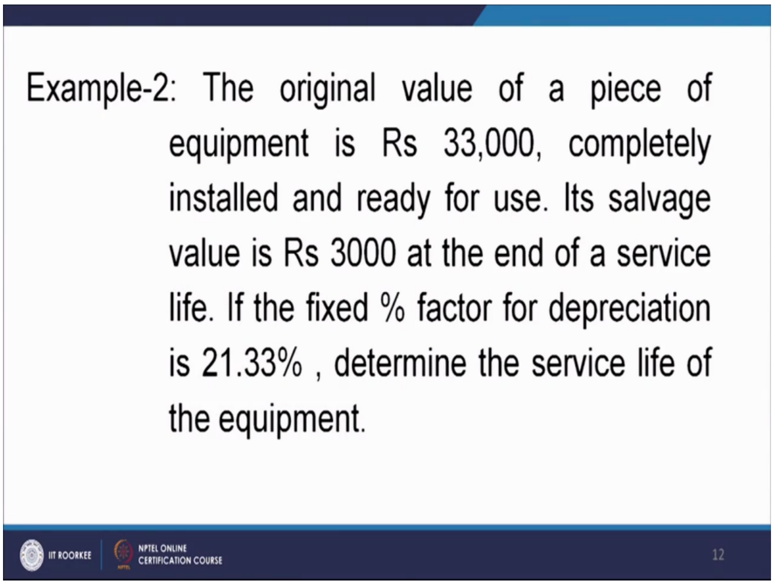
Now, start with the examples and take the first example, the first example is the original value of a piece of equipment is rupees 33,000, completely installed and ready to use, its salvage value is RS 3000 at the end of a service life estimated to be 10 years. Determine the asset or book value of the equipment at the end of 5th year using declining-balance method.

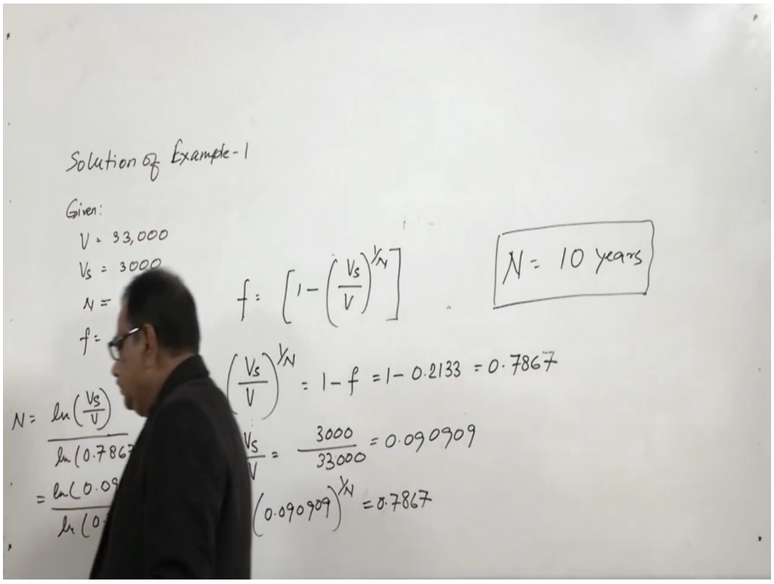
Now, what is given, given V it is equal to 33,000 at the initial value of the asset, Vs is equal to 3000, N is equal to 10 and we need to calculate what is V5. The asset value or the book value at the end of 5th year. Now, the fixed percentage factor is equal to 1 - Vs - V to the power 1 by N. Now, here Vs is the salvage value, V is the original value and this factor f is equal to 1 - 3000 by 33000 to the power 1 by 10. So, we can calculate this, this is equal to 1 -

3000 divided by 33000 comes out to be 0.09091 to the power 0.1. This is equal to 1 - 0.786794 and this equal to 0.2132 that is 21.32 percent.

Now, we have computed the f factor this comes out to be 21.32 or 21.32 percent. Now, we can calculate book value. Book value at the end of 5th year is equal to V5 is equal to V into 1 - f to the power 5. This is 33000 into 1 - 0.2132 to the power 5 and this comes about comes to be rupees 9950.289, this is our answer.

(Refer Slide Time: 16:06)



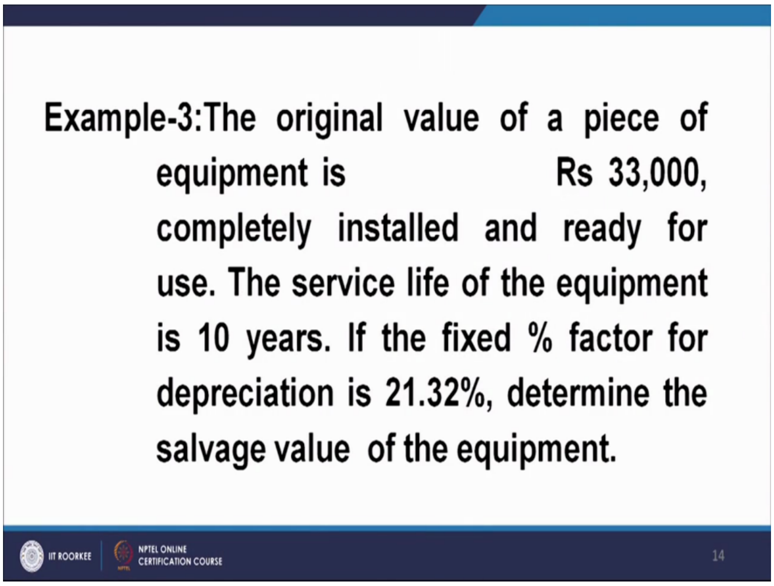


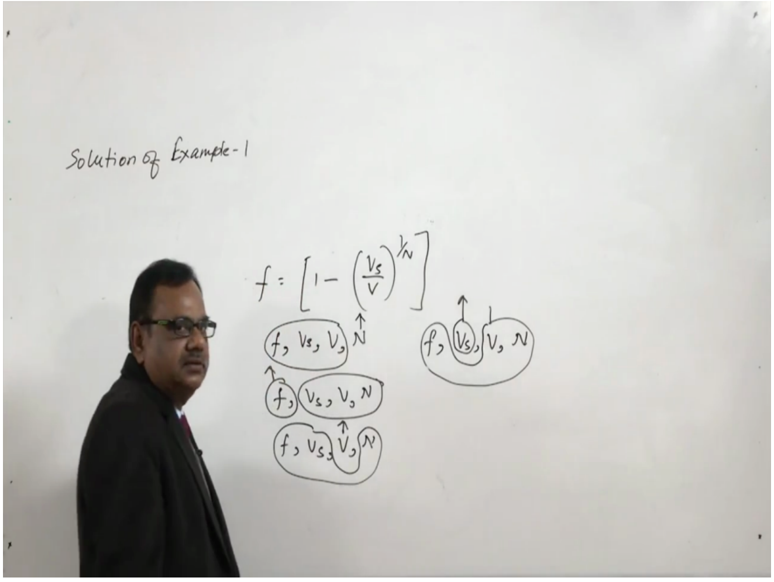
The second example is, the original value of a piece of equipment is 33000, completely installed and ready for use. Its salvage value is rupees 3000 at the end of a service life. If the fixed percentage factor for depreciation is 21.33 percent, determine the service life of the equipment. Now, we do not know the value of N where the value of f is given, 0.2133. So, my V is given the original value of the equipment, Vs is given 3000, f is given 0.2133 but N is not given, I have to calculate the value of N.

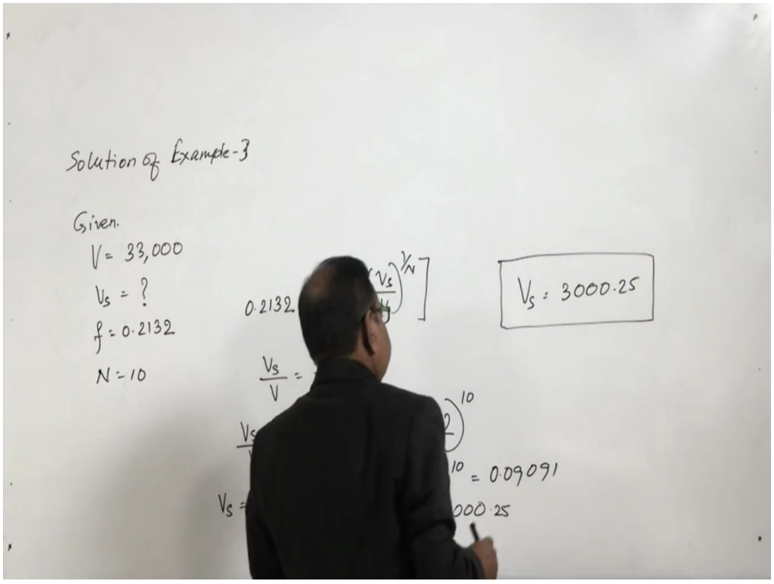
Now, we start with our formula first, percentage factor is equal to 1 - Vs by V to the power 1 by N or Vs by V to the power 1 by N is equal to 1 - f and this is equal to 1 - 0.2133 which is equal to 0.7867. Now, if we calculate Vs by V, this is 33000 divided by, sorry this is 3000 by 33000, and which comes out to be 0.090909. So, 0.090909 to the power 1 by N is equal to 0.7867.

Now, if I take log N is equal to log Vs by V divided by log 0.7867 this is equal to Ln 0.090909 divided by Ln 0.7867 and this is equal to 9.995 or I can say 10 years. So, this is the answer of the example number two. So, N is 10 years. Let us move to example number three, again the same numerical is used but with a twist.

(Refer Slide Time: 20:51)







The original value of a piece of equipment is rupees 33000 completely installed and ready for use. The service life of the equipment is 10 years if the fixed percentage factor for depreciation is 21.32 percent, determine the salvage value of the equipment. Basically, here I would like to explain our basically equation is f is equal to 1 - Vs by V to the power N. This is the equation every time I am using to calculate different values.

Here, if we see in this equation the variables are f, Vs, V and N. So, there are 4 variables and this is a single equation and the single equation can only give the value of a single unknown, that means if I supply the values of these three, I can calculate out N or if I supply the value of these three, I can calculate this one or if I supply value of these three, I can calculate this or if I supply of this, then I can calculate this one.

So, this is how the questions are framed. In this case, we have to find out what is value of Vs. So, f is given, V is given and N is given. So, this is example number three, given V is given 33000, Vs is unknown, f is equal to 0.2132, N is equal to 10. So, we have 0.2132 is equal to 1 - Vs by V to the power one by N. Now, Vs by V is equal to 3000 divided by 33000. Here, we do not know the value of Vs basically this is unknown, this is unknown.

So, I can write down Vs by V is equal to 1 - f to the power N is equal to 1 - 0.2132 to the power 10, this comes out to be, this is 0.7868 to the power 10, to the power 10 comes out to be 0.09091. So, Vs is equal to 33000 into 0.09091 is equal to rupees into 33000 comes to be 3000, 25paisa. So, my answer is Vs is equal to.

Now, let me summarize today's lecture. The monetary value of an asset decreases over time due to use wear and tear or obsolescence. This decrease measured as depreciation and can be used as a means of distributing the original cost of a physical asset over the life period during which the asset is in use employing many methods. The present lecture demonstrates how to use declining-balance method for depreciation computations and also shows where you should use declining-balance method and what benefits you can extract using declining-balance method in taxation. Thank you.