Depreciation, Alternate Investment and Profitability Analysis.
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Lecture-12.
Alternative Investment – Perpetuity Method.

Welcome to the course Depreciation, Alternate Investment and Profitability Analysis. We are continuing with module two which is alternative investment. In this lecture I will be covering perpetuity method which is a method to select alternate investments. Perpetuity or capitalized cost method, because of the varying service life, it was necessary to arrive at a least common multiple of service lives in the present worth method.

Sometimes it may be difficult and time-consuming to arrive at a least common multiple of estimated lives of all the assets involved in study. In such cases, it is much easier to compare the alternatives using capitalized cost method. Capitalized worth is the present worth of a perpetuity, it indicates that the amount of money needed at present time such that the interest earned will cover the cash flow requirements forever for the investment. This method is generally used by governments and assumption is made here that the assets when renewed repeat their cost history.

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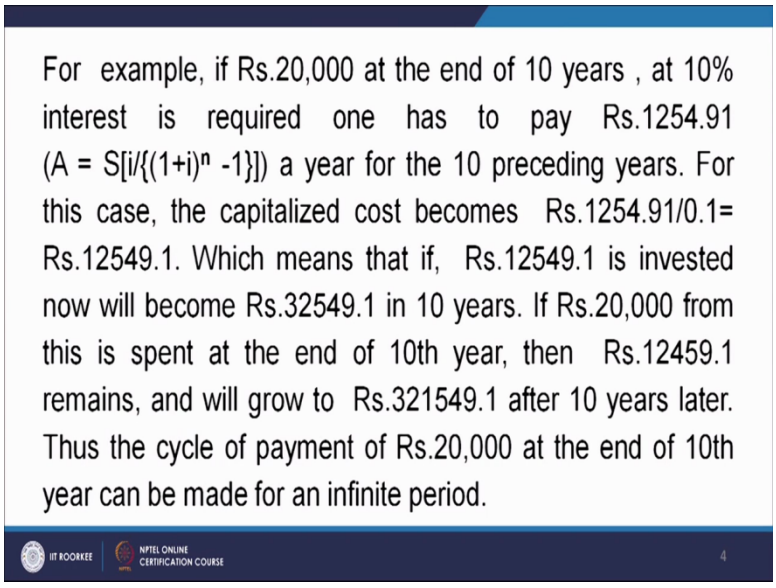

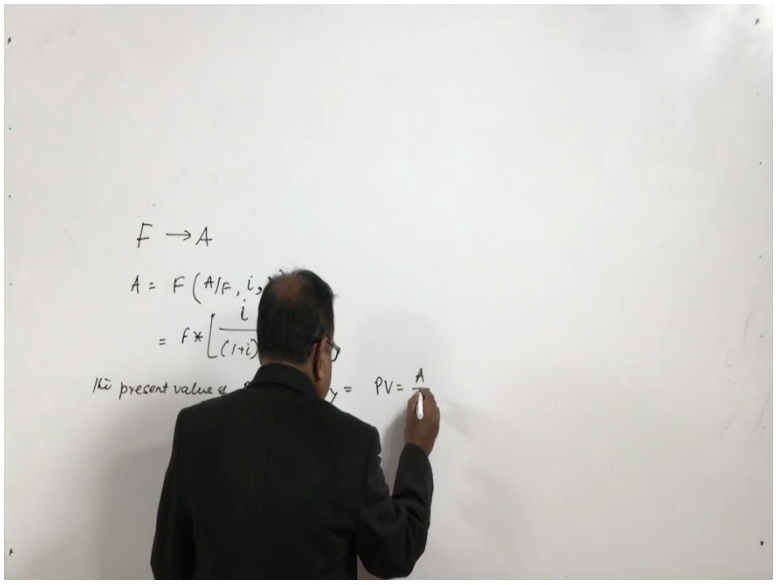

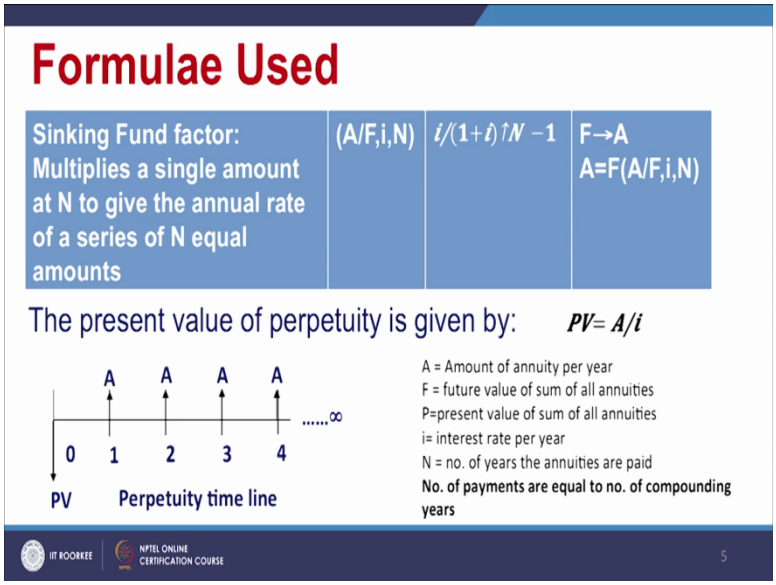

Capitalized costs are annual costs divided by the interest rate, for example if rupees 20,000 at the end of 10 years, at 10% interest is required one has to pay 1254.91 a year and this value has been calculated from the annuity formula which converts a future value to a annuity, which has been given in the slide. For the ten preceding years, for this case, the capitalized cost becomes 1254.91 divided by 0.1 which is the value of i which comes out to be 12,549.1, which means that if 12549.1 is invested today, that is now, will become 32,549.1 in 10 years and if 20,000 from this is spent at the end of the 10 year, then rupees 12,459.1 will remain and will again grow to rupees 32549 after 10 years later.

Thus the cycle of payment of rupees 20,000 at the end of 10^{th} year can be made for an infinite period. Now formula used what are the formulas we have to use in this are, now F to A, future value to annuity this is A is equal to F A by F, i, N and this formula this one is equal to

F into 1 i divided by 1 + i to the power N - 1 and present value of a perpetuity is equal to PV is equal to A by i, now let us apply this in different numericals.

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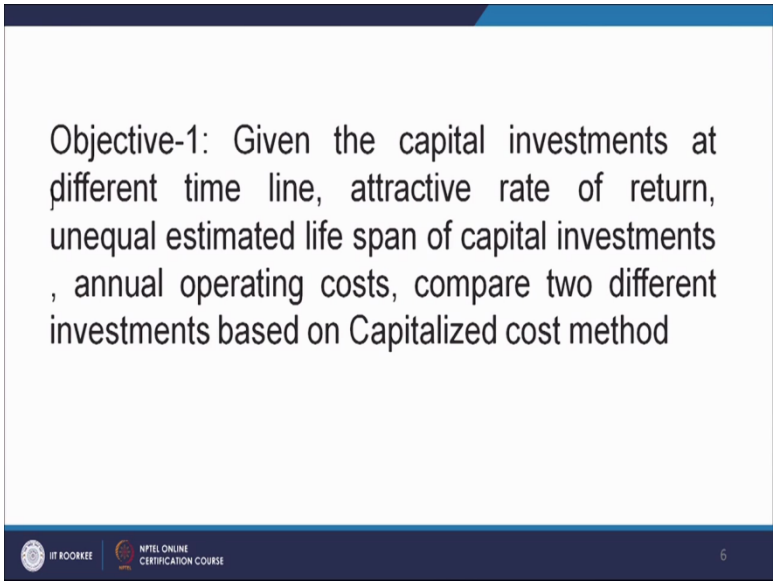

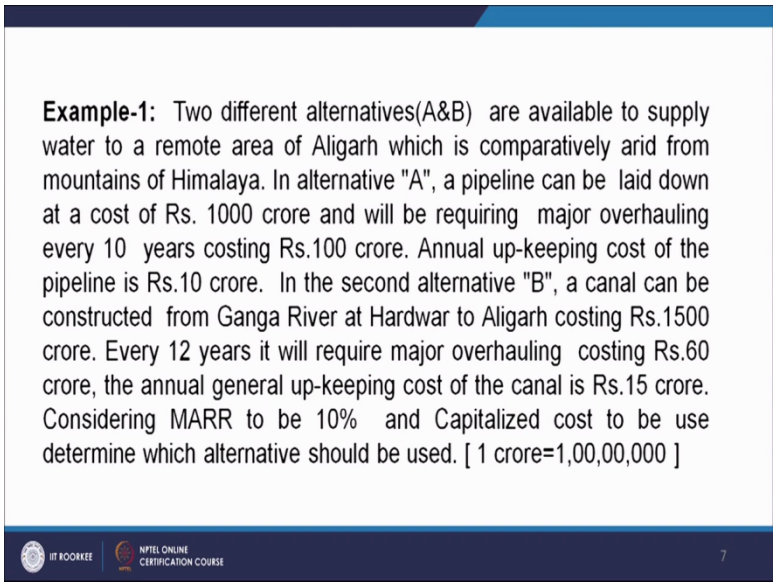

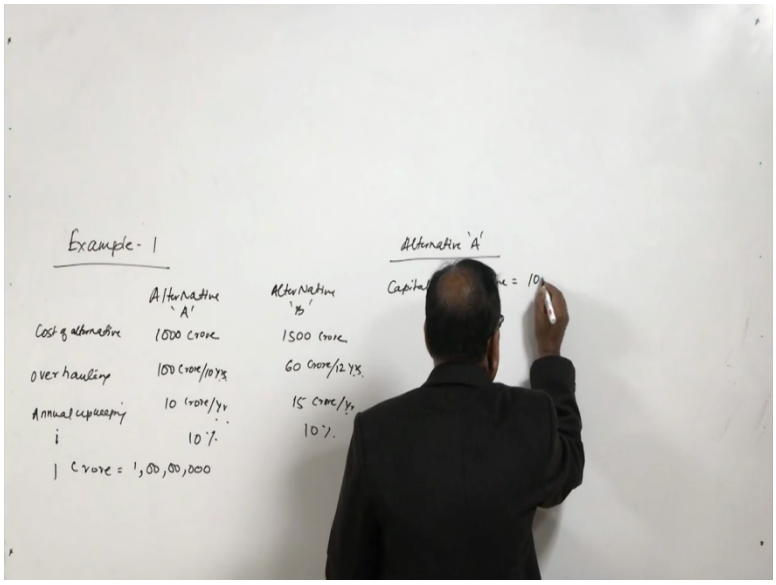

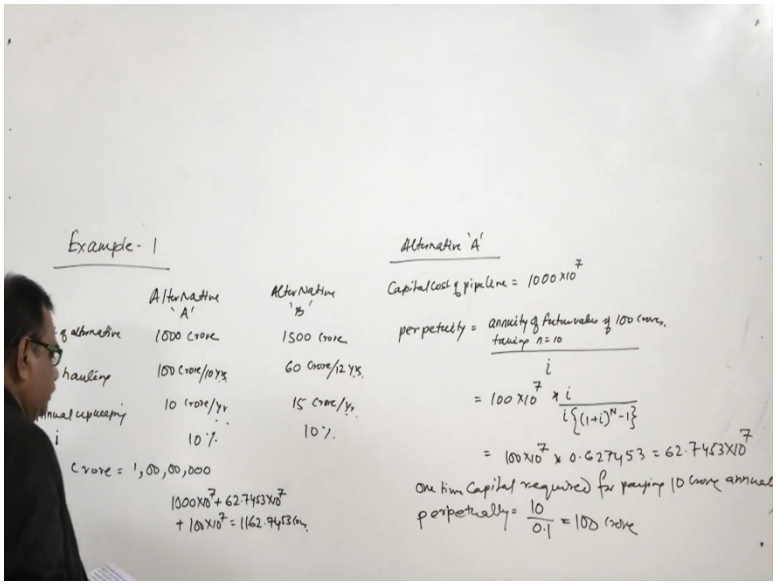

Now objective one given the capital investments at different time line, attractive rate of return, unequal estimated life span of capital investment, annual operating cost, compare two different investments based on capitalized cost method. For example one, two different alternatives A and B are available to supply.

Example one, two different alternatives A and B are available to supply water to a remote area of Aligarh which is comparatively arid from mountains of Himalaya. In alternative A, a pipeline can be laid down, a pipeline can be, cost, this is hundred crores will be required measure or overhauling every 10 years costing this is 1000 crores,100 crores overhauling is 100 crores, 10 years, every 10 years and annual up keeping cost of the pipeline is 10 crores per year.

Now for the B to construct a canal from the Ganga river to a Haridwar to Aligarh costing 1500 crore, overhauling cost is 60 crore every 12 years, up keepng cost is 15 crore per year and the value of i is 10%. Now one crore is this, so let us analyze this and suggest which alternative I should select based on the perpetual cost method.

So solution alternative A capital cost of pipeline is equal to 1000 into ten to the power seven rupees, one-time capital cost of hundred crores required overhauling over 10 years, so perpetuity will be, perpetuity will be annuity of future value of hundred crores taking N equal to 10 divided by i. So what I have to do this hundred crores is a future value but as after 10 years I have to spend hundred crores.

So I have to find out the annuity of this 100 crore, that means annuity of a future value, taking N equal to 10 and then divided by i so this comes out to be hundred into 10 to the power seven into i divided by i into one + i to the power N - I, this is the formula. And if I solve this this becomes hundred into 10 to the power seven into 0.627453 equal to 62.7453 into ten to the power seven.

So this perpetuity of this, that means if I spend this much of money, then I will get enough money to spent one hundred crores every 10 years. Now one time capital required for paying 10 crore annually, perpetually equal to ten divided by 0.1 which is the value of i becomes hundred crores. As the total capital required from the project to run it perpetually for a, this is 1000 into 10 to the power 7 + 62.7453 to the power seven + 100 to the power seven.

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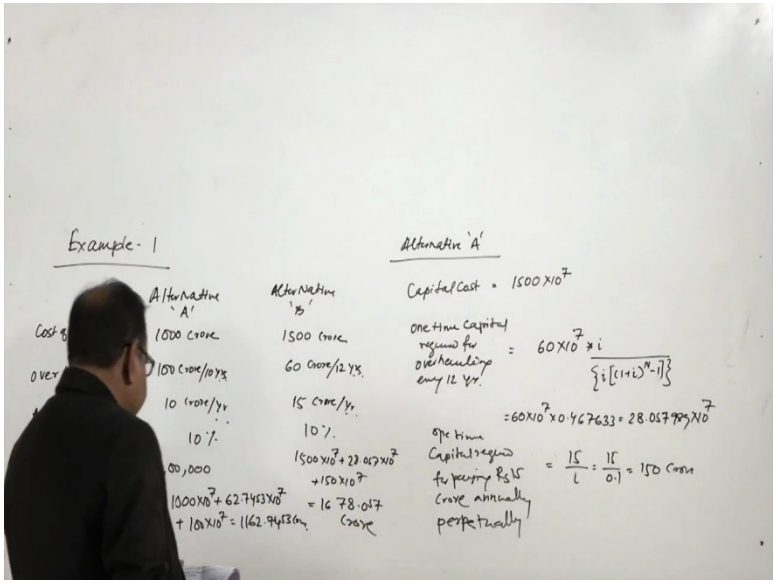

This comes out to be 1162.7453 crore, similarly for alternative B we can calculate, now the capital cost is equal to 1500 into 10 to the power seven, one-time capital required for overhauling every 12 years is equal to 60 into10 to the power seven into i divided by i one + i to the power N - one, this value. This comes out to be 60 into 10 to the power seven into 0.467633 equal to 28.057989 into ten to the power seven.

Now one-time capital required, one-time capital required for paying rupees 15 crore annually, perpetually equal to 15 divided by i, equal to 15 divided by point one equal to hundred fifty crore. So, total capital required here in the case of B is fifteen hundred into 10 to the power 7 + 28.057 into 10 to the power seven + hundred fifty into ten to the power seven is equal to 1678.057 crore. So as the alternative A requires less capitalized cost this than the alternative B, it should be selected.

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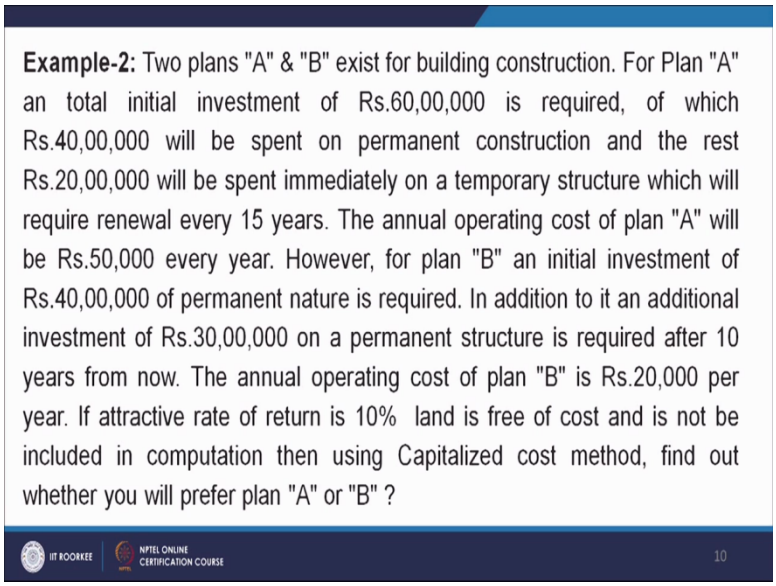

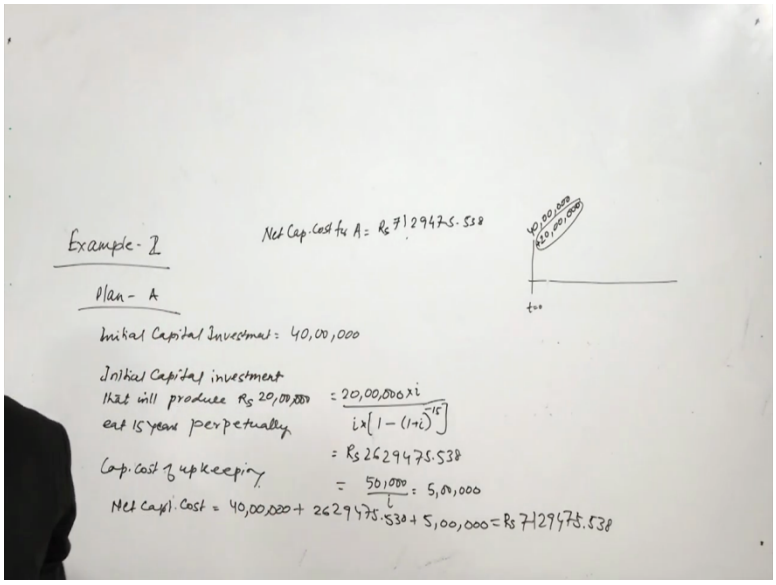

This is example two, two plans A and B exist for building construction, for plan A an total initial investment of sixty lakhs is required, for which forty lakhs will be spent on permanent construction and the rest 20 lakhs will be spent immediately on temporary structure which will require renewal every 15 years. The annual operating cost of plan A will be rupees 50,000 every year. However for plan B an initial investment of 40 lakhs is required of permanent nature. In addition to it an additional investment of rupees 30 lakhs on a permanent structure is required after 10 years from now. The annual operating cost of Plan B is rupees 20,000 per year. If attractive rate of return is 10%, land is free of cost and is not be included in computation then using capitalized cost method, find out whether you will prefer plan A or plan B.

This numerical we have solved using other methods also, so let us solve it. Initial capital investment equal to forty lakhs, capitalized cost of the temporary structure of 20 lakh will stay for 15 years. So, initial capital investment that will produce 20 lakhs each 15 years perpetually, this can be given by 20 lakh into i divided by i into in bracket one + I, this I am converting my initial investment that is P to A.

So this will be 1 - 1 + i to the power - 15 and this comes out to be rupees 2629475.538. Now please note that 20 lakhs is the present worth value of the investment as it is done at the same time as the investment 40 lakhs, that means in the timeline t equal to zero here I am investing 40 lakhs + 20 lakh.

So this is the initial value here 20 lakh and this initial value 20 lakh, the present value has to be converted into annuity and that annuity has to be divided by i to convert into perpetuity. So

this is done like this, now capitalized cost of up keeping is equal to 50,000 divided by i equal to five lakh. So the net capitalized cost, 40 lakh + 2629475.538 + five lakh, which comes out to be rupees 7129475.538, so here we write down net capitalized cost for A is equal to rupees 7129475.538, similarly for plan B, I can calculate.

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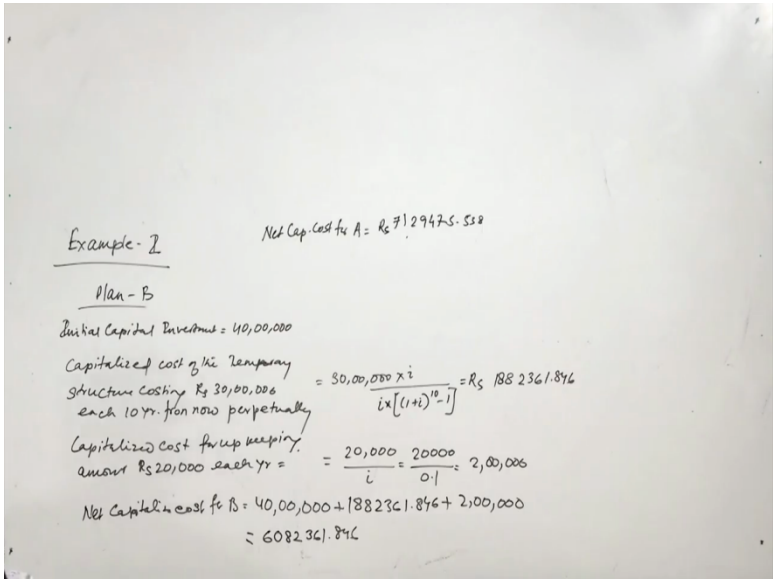

Initial capital investment equal to 40 lakhs, capitalized cost of the temporary structure costing rupees thirty lakh, each 10 year from now perpetually is equal to 30 lakhs into i divided by i into one + i to the 10 - one. Now why, we will see that this formula has changed in compared to the first one, because at the first one that 20 lakh was the present value here the 30 lakh is future value.

So we are converting a future value to annuity and that's why this formula has changed and this comes out to be rupees 1882361.846. Now the capitalized cost for up keeping amount rupees 20,000 each year is equal to 20,000 divided by i is equal to 20,000 divided 0.1 equal to two lakh. Now if we add net capitalized cost for B is equal to 40 lakh + this value 1882361.846 + these value two lakh and this comes out to be 6082361.846.

Now as the net capitalized cost for plan B is less than plan A, plan B is selected for investment, so this is selected for investment. To summarize, we have seen that the perpetuity or capitalized cost method can solve some problems easily, depending upon the situation of the problem and data of the problem. And here we have seen that how to apply this technique for alternative investment that is perpetuity or capitalized cost method. Thank you.