8. Depreciation

Definition

- Depreciation is the reduction in value of Capital asset.

- Depreciation is loss in value of capital goods due to wear and tear, ageing or obsolescence.

- Depreciation is the gradual and permanent decrease in the value of a capital asset from any causes.

- Depreciation may be defined as the permanent decrease in the value of assets due to use and or the lapse of the time.

Causes of Depreciation

- **Wear & Tear:** The continuous use of an asset makes it old and decrease in working capacity and hence the value of asset depreciates.

- **Effusion of time:** With the passage of time, the value of some assets diminishes, even if they are not used in the business.

- **Obsolescence:** An existing asset may loss its usefulness due to an improvement in technology, new invention, change in style etc.

- **Exhaustion or depletion:** An asset may get exhausted through working. It applies to mines and quarries.

- **Accident :** Due to accident, it also may cause depreciation in assets, such accidental causes may be natural disasters or man-made disasters.

- **Fall in market value:** The value of an asset may decrease due to fall in market price of the assets.

Depreciation Methods

There are several methods of depreciation, the selection of method for providing depreciation depends upon types of asset, nature of asset use, management policy, legal provisions etc. some important methods of depreciation are as follows:

1. **Straight line method**

It is the simplest method for charging depreciation. It is also known as fixed installment method. Under this method, the same or equal or fixed amount of depreciation is charged every year throughout the life of the asset so that the book value of asset may be reduced to zero.

Annual Depreciation = [Original cost of asset - Estimated salvage value (if any)]/Estimated life of the asset.

If rate is given,

Annual Depreciation = Total depreciable value x rate (%)/100

Rate of depreciation = (Amount of annual depreciation / Total depreciable value)x100

Alternatively, Rate of Depreciation = 1/N X100 (Where N= life of asset)

(Note: Total depreciable value=Initial cost + All other expenses – Salvage value)

Example:

A machine costing of Rs. 11,000 is estimated to have a life of 10 years and the salvage value is estimated Rs. 1,000 at the end of life. Determine annual depreciation and rate of depreciation by using straight line method.

Soln:

We can use following formula to calculate depreciation of straight line method.

$d_k = (B-S)/N$

$D^*_k = K(B-S)/N$

$BV_k = B - D^*_k$

Where, dk = Annual depreciation deduction in the year K

$\quad$ B = Original cost/Initial cost

$\quad$ S = Salvage Value

$\quad$ N = Life of the asset

$\quad$ D^*_k = Cummulative depreciation through year K

$\quad$ BV_k = Book value at the end of year K

Eg: From above example find

a)$\quad$ Depreciation amount for the 6th year

b)$\quad$ Accumulated depreciation throughout 6th year

c)$\quad$ Book value at the end of 6th year

Advantages

i)   It is simple to calculate and easy to understand.

ii)   It can write off the total cost of asset completely at the end of life.

iii)   It makes easy for valuation of asset.

Disadvantages

i)   It is not proper to provide equal depreciation when asset is getting old.

ii)   It ignores interest on capital invested in fixed assets.

iii)   This method is not recognized by income tax authorities.

2. **Declining balance method (Also known as reducing balance or Written down value or accelerated depreciation)**

- also called constant or uniform or average percentage method and it is also known as Matheson method.

- This method is assumed that the annual cost of depreciation is a fixed or constant percentage of the book value at the beginning of the year.

- As the depreciation is charged at the rate of fixed percentage, the depreciation amount continues to diminish in successive years.

- This approach is more realistic approach, since the depreciation charge decreases with the life of the asset which matches with the earning potential of the asset.

- Under this method we cannot reduce the book value of asset to zero.

(Note: Book Value=Original Cost-Accumulated Depreciation)

Case: If salvage Value is not given

Q. A Machine costs Rs. 200000 now. Calculate depreciation and corresponding book value in each year for 5 years using declining balance method.

Depreciation Rate R = 100%/ 5

Formulas

$$d_K = B(1-R)^{K-1}(R)$$

$$D^*_k = B[1-(1-R)^k]$$

$$BV_k = B(1-R)^k$$

$$SV = I(1-R)^N$$

EOY	Depreciation	BV
0		
1		
2		
3		
4		
5		

From above Q also find d4, D*4 BV4 and D*5 and SV

CASE II: If Salvage Value is given

Q. A Machine costs Rs. 200000 now. Estimated Salvage Value is 20000. Calculate depreciation and corresponding book value in each year for 5 years using declining balance method.

In order to extract the percentage (rate), the following formula is used

$$R = 1 - \sqrt[N]{\frac{S}{B}}$$

Where,   R= Rate of Depreciation

N= Estimated life of asset

S = Salvage Value

B = Original Cost

From above Q also find d4, D*4 BV4 and SV

Advantages

- High amount of depreciation for earlier years of assets and as assets getting old, depreciation goes on diminishing is more scientific

- It is suitable for assets having long life such as building, plant and machinery.

- It is recognized by income tax authorities

Disadvantages

- It is difficult to decide the rate of depreciation if salvage value is not given

- The book value of asset cannot be reduced to nil with this method.

- It is applicable only for long life assets

- It ignores interest on capital invested in fixed assets.

3. Double rate declining balance method

According to this method, depreciation rate will be calculated under SLM and multiply it by 2. then, the amount of depreciation is calculated by adopting declining balance method, so as to bring down the book value of asset to its salvage value.

Hence, Depreciation Rate (R) = (1/N)x100x2

Eg. A machine is costing of Rs. 5,00,000 with estimated salvage value Rs. 5,000 at the end of 5th year. Find depreciation amount by **Double Rate Declining Balance Methods**.

4. Sum of the Year Digit (SOYD)

Depreciation is calculated on the basis of proportion of total number of estimated life years of an asset.

- This methods results larger depreciation charges during the beginning years of asset and smaller depreciation charges as asset getting old.

$$\text{SOYD Depreciation} = \frac{\text{Remaining useful life at the begining of particular year}}{\text{SOYD for the total useful life}} \times (I - S)$$

Eg. A machine is costing of Rs. 5,00,000 with estimated salvage value Rs. 5,000 at the end of 5th year. Calculate depreciation charges per annum under **SOYD**.

5. Service-output method (Unit of Production Method)

In this method the decrease in value of any asset is based on total working hour or production unit.

This method gives equal depreciation charge for each unit of output or working hour regardless of the lapse of time involved.

Depreciation rate per unit of output/working hour (R);

$$= \frac{I - S}{\text{Total Working hour or production unit}}$$

Where, I= Initial Investment   S= Salvage value

Eg. A machine costing of Rs. 50,000 is estimated to have Rs. 10,000 salvage value when replaced after 30,000 hours of used. Find its depreciation rate per hour of use and book value after 10,000 hours of operation.

6. Sinking Fund Method

Sinking Fund Method of depreciation ensures that the full capital invested in a project is recovered at the end of project's life.

This methods provides fixed periodic charges (constant amount) at the end of each period that earns compound interest over the life of the asset and would be equal to the original cost of assets.

The fixed sum depreciated at the end of every time period earns an interest rate of i% compounded annually.

To Find,

Fixed annual equivalent amount $(A) = (I-S) \times (A/F, i\%, N)$

Net depreciation charges in the year K

$$d_K = (I-S) \times (A/F, i\%, N) \times (F/P, i\%, K-1)$$

Book value at the end of year/period K,

$$BV_K = I - (I-S) \times (A/F, i\%, N) \times (F/A, i\%, K)$$

Eg. Compute the depreciation charge and book value in each year by using sinking fund method with following information.

Initial Cost= 2,00,000   Salvage Value=20,000   Life of asset=6Years   i=12%

INTEREST FACTORS FOR DISCRETE COMPOUNDING
Interest Rate Factor (12%)

N	Single Payment		Equal Payment Series				Gradient Series	
	Compound Amount Factor (F/P,i,N)	Present Worth Factor (P/F,i,N)	Compound Amount Factor (F/A,i,N)	Sinking Fund Factor (A/F,i,N)	Present Worth Factor (P/A,i,N)	Capital Recovery Factor (A/P,i,N)	Gradient Uniform Series (A/G,i,N)	Gradient Present Worth (P/G,i,N)
1	1.1200	0.8929	1.0000	1.0000	0.8929	1.1200	0.0000	0.0000
2	1.2544	0.7972	2.1200	0.4717	1.6901	0.5917	0.4717	0.7972
3	1.4049	0.7118	3.3744	0.2963	2.4018	0.4163	0.9246	2.2208
4	1.5735	0.6355	4.7793	0.2092	3.0373	0.3292	1.3589	4.1273
5	1.7623	0.5674	6.3528	0.1574	3.6048	0.2774	1.7746	6.3970
6	1.9738	0.5066	8.1152	0.1232	4.1114	0.2432	2.1720	8.9302
7	2.2107	0.4523	10.0890	0.0991	4.5638	0.2191	2.5515	11.6443
8	2.4760	0.4039	12.2997	0.0813	4.9676	0.2013	2.9131	14.4714
9	2.7731	0.3606	14.7757	0.0677	5.3282	0.1877	3.2574	17.3563
10	3.1058	0.3220	17.5487	0.0570	5.6502	0.1770	3.5847	20.2541
11	3.4785	0.2875	20.6546	0.0484	5.9377	0.1684	3.8953	23.1288
12	3.8960	0.2567	24.1331	0.0414	6.1944	0.1614	4.1897	25.9523
13	4.3635	0.2292	28.0291	0.0357	6.4235	0.1557	4.4683	28.7024
14	4.8871	0.2046	32.3926	0.0309	6.6282	0.1509	4.7317	31.3624
15	5.4736	0.1827	37.2797	0.0268	6.8109	0.1468	4.9803	33.9202

7. Modified Accelerated Cost Recover System (MACRS)

Historically, for tax and accounting purpose an asset's depreciable life was determined by its estimated useful.

After 1980 and before 1987, tangible properties were depreciated by using the Accelerated Cost Recovery System (ACRS) & this system was implemented by Economic Recovery Tax Act of 1981 (ERTA) in USA.

After 1986, the tax reform Act of 1986 (TRA 86) in the history of US modified the previous ACRS and requires the use of MACRS for the depreciation of tangible property.

MACRS is the principal method for computing depreciation in engineering projects. Under MACRS, the SV_N is defined to be Zero and useful life estimates are not used directly in calculating depreciation amount.

The MACRS Scheme includes eight categories of assets with lives of 3, 5, 7, 10, 15, 20, 27.5 and 39 years.

-For short lived assets like plastic products depreciated over 3 years by using 200% DB and then switching to SL Method.

- Computer, automobiles & Light trucks are written off 5years by using 200% DB and then purpose

-Most types of manufacturing equipments, office furniture, fixtures and depreciated over 7 to 10 years by using 200% DB and followed by a switch to SL method.

- Sewage (drain) treatment plants & telephone distribution plants are written off over 15 years by using 150%DB and then switching to SL Method.

-Sewer pities & electrical power plants are written off over 20 years by using 150% DB and then switching to SL method.

-Residental rental property are written off over 27.5 years by SL method.

-Non residental real estate (commercial buildings) including elevators and escalators is written off by the SL method over 39 years.

A half-year time convention is used in MACRS depreciation calculation that means all assets placed in service before the middle of the year. Hence, a half year's depreciation being taken in the first year, a full year's depreciation is allowed in each of the remaining years and a half year's depreciation is taken in the year following the end of the recovery period.

Eg. A taxpayer wants to place in service of Rs. 20, 000 asset that is assigned to the 3 years class. Compute the MACRS% and depreciation amount for the asset.

Table A-1. 3-, 5-, 7-, 10-, 15-, and 20-Year Property Half-Year Convention

Year	Depreciation rate for recovery period					
	3-year	5-year	7-year	10-year	15-year	20-year
1	33.33%	20.00%	14.29%	10.00%	5.00%	3.750%
2	44.45	32.00	24.49	18.00	9.50	7.219
3	14.81	19.20	17.49	14.40	8.55	6.677
4	7.41	11.52	12.49	11.52	7.70	6.177
5		11.52	8.93	9.22	6.93	5.713
6		5.76	8.92	7.37	6.23	5.285
7			8.93	6.55	5.90	4.888
8			4.46	6.55	5.90	4.522
9				6.56	5.91	4.462
10				6.55	5.90	4.461
11				3.28	5.91	4.462
12					5.90	4.461
13					5.91	4.462
14					5.90	4.461
15					5.91	4.462
16					2.95	4.461
17						4.462
18						4.461
19						4.462
20						4.461
21						2.231

8. Straight line Plus Average Interest Method (Declining Balance with switchover to straight line method)

The declining balance method never reaches a book value of an asset to zero, it is permissible to switch from this method to the straight line method so that an asset's value will become to zero.

According to this method, the switchover occurs in the year where a larger or equal depreciation amount is obtained from the straight line method in comparison to declining balance method.

Eg. Consider the following information for a machine operation system

Initial Cost= Rs. 8,000   Useful life = 6 years   Salvage= 0

Depreciation Rate = 25% per year

Compute the annual depreciation amount and book value by declining balance conversion to straight line method.

Q. If a machine costing of Rs. 4,00,000 is estimated 10 years useful life and Rs. 50,000 Salvage Value. Find depreciation amount for each year by using sinking fund and declining balance method.

Soln

Hint for Sinking Fund

Fixed annual equivalent amount (A) = (I-S)x(A/F, i%, N)

Net depreciation charges in the year K

$$d_K = (I-S)x(A/F, i\%, N) \times (F/P, i\%, K-1)$$

Book value at the end of year/period K,

$$BV_K = I-(I-S)x(A/F, i\%, N) \times (F/A, i\%, K)$$

Eg. A photocopy machine is costing of Rs. 4,60,000 with estimated salvage value Rs. 12,000 at the end of 6th year. Find yearly depreciation amount and book value by

(i) Double declining balance conversion to straight line method.

(ii) Sum of years Digit (SOYD) method   8Marks(Spring 2019)

Q. A company is considering the purchase of second-hand computers at a cost of Rs. 10,500 each with an estimated salvage value of Rs. 500 and a projected useful life of four years. Determine the annual depreciation and book values using double declining balance with conversion to Straight line depreciation method.   8 Marks (Fall 2019)

Advantages of Providing Depreciation Fund

Depreciation is essential due to following reasons

- **Ascertainment of cost of production:** It is necessary to charge depreciation as an item of cost for showing a true and fair view of the cost of production. In the absence of depreciation, the production cost appears to be lower than the actual cost.

- **Correct ascertainment of net profit or loss:** Depreciation is also an expenditure item as wages, rent, salary etc. therefore, it must be charged for the correct ascertainment of profit or loss.

- **Replacement of assets:** It is non-cash expense. It is retained in the business and used for the replacement of fixed asset at the end of its useful life because the new asset can be purchased with the accumulated depreciation funds.

- **To keep capital safe:** If depreciation is not charged, the profit shown by the profit and loss account will be in excess of actual profit and it is distributed among the owners. As such, the amount of depreciation is actually a part of capital asset and to keep capital safe, depreciation is most essential

- **For correct ascertainment of income tax:** If depreciation is not charged, the profit and loss account will show more profit and the firm will have to pay more income tax on the profit. Hence, the depreciation is charged for the correct assessment of income tax.

- **Fair Financial Position:** if depreciation not charged then assets will be shown at a value more than its actual value.

Q 2013 Fall

5a we have just purchased a minicomputer at a cost of Rs. 20,000 with an estimated salvage value of Rs. 1000 and a projected useful life of 6 years. If interest is 12% per year, determine
i) Sum of the year digit (SYOD) depreciation
ii) Double rate declining balance depreciation

Q2014 Fall

3a what are the causes for depreciation? If a machine costing of Rs. 4,00,000 is estimated 10 years useful life and Rs. 50,000 salvage value. Find depreciation amount for each year by using declining balance and sinking fund methods.

Q2014 Spring

5a Consider following accounting information for a computer system.

Cost basis of the asset Rs. 40,000

Useful life 5 years

Estimated salvage value Rs 2500

Compute annual depreciation and resulting book value using double declining balance method.