Placed assets loose their value even as they continue the function and contribute to engineering project that use them. This lose value is called depreciation.

→ Most assets lose their value over time (in other words they depreciate) and must be replaced once the end of their useful life is reached.

Depreciable property

ⓐ Tangible (seen or touched)

- Personal
  - → machinery
  - → vehicles
  - → furniture
- Real
  - → land (Because it does not have determinable life)

ⓑ Intangible (personal property)

- → copyright
- → patent
- → Goodwill
- → trade mark

* Economic Depreciation

(a) Physical : Reduction in assest capacity to perform it intended service due to physical impairment.
(corrosion, chemical changes & wear and tear)

(b) Functional : Due to change in organization or it technology that decrease or eliminate need for asset.

Some definations

(1) Cost basis or Unadjusted cost

→ Initial cost of acquiring assets (purchase price + taxe) + transportation or other normal cost. (like installation)

→ It represent the total cost that is claimed as expense over an asset life i.e sum of annual depreciation assets.

(2) Book value (BV).

→ The worth of depreciable property as shown as accounting records of company.

① Recovery period

→ It is the depreciable life (n) of the assets in years

② Market value (MV)

→ The amount that will be paid by buyer to seller for property under no compulsion to buy or sell.

③ Salvage value

→ the estimated value of property at the end of useful life.

Basic methods of depreciation

① Straight line method

→ It assumes that a constant amount is depreciated each year over the useful life of the asset.

$$D_n = \frac{I - S}{N}$$

D_n = Depreciation change during year n
I = cost of the assets including installation expenses

S = Salvage value at the end of useful life

N = useful life

Book value in a given year
= Cost Basis − total depreciation

Example 1:

Consider the following data

I = 10,000

N = 5 yrs

S = 2000

Compute the annual depreciation allowance and the resulting book value using the St line depreciation method?

Soln:-

I = Rs 10000 N = 5 yrs , S = 2000

$$D_n = \frac{I - S}{N} = \frac{10000 - 2000}{5}$$

$$\therefore D_n = 1600$$

Book value — Book value before depreciation ↓ ; ↓ after depreciation BV

h.	B_{n-1}	D_n	B_n
1	10,000	1600	8400
2	8400	1600	6800
3	6800	1600	5200
4	5200	1600	3600
5	3600	1600	2000

↓ N (Scrap value)

Sum of the year Digit method

SOYD $= 1+2+3+\dots+N$

$= \frac{N(N+1)}{2}$

$D_n = \frac{(N-n+1)}{SOYD}(I-S)$

(N = useful life; n = respective year (1st year = 1, 2nd year = 2))

$SOYD = \frac{N(N+1)}{2} = \frac{5\times6}{2} = 5\times3 = 15$

* I = Rs 20,000 N = 5 yrs, SV = 2000

Years	B_{n-1}	D_n	B_n
1	20,000	$\frac{5}{15}(20,000-2000)(5-1+1) = 6000$	14000
2	14,000	$\frac{(5-2+1)}{15} \times (I-S) = 4800$	9200
3	9200	$\frac{3}{15}(I-S) - \frac{(5-3+1)}{15}(I-S) = 3600$	5600
4	5600	$\frac{5-4+1}{15}(I-S) = 2400$	3200
5	3200	$\frac{5-5+1}{5}(I-S) = 1200$	2000

SV

(#) Declining Balance method

→ It is also known as fixed % or uniform % method.

→ In this method book value is multiplied by the fixed rate.

$$d = \frac{1}{N} \times \text{multiplier}$$

The most commonly used multiplier is double the st line rate for this reason

It is called double declining or balance method

$$\alpha = \frac{1}{N} \times 2$$

Ex I = Rs 10,000 N = 5 yrs, S = 778 find

On and Bn for N = 1 to 5 using DDB method

$$\alpha = \frac{2}{N} = 0.4 = 40\%$$ decrease

$$= (\alpha \times B_{N-1}) \qquad (B_{n-1} - On)$$

n	Bn-1	On	Bn
1	10,000	4000	6000
2	6000	2400	3600
3	3600	1440	2160
4	2160	864	1296
5	1296	518.4	777.6 ≈ 778

If SV = 2000 in this Qn (BV < S)

↓ SV same case no extra case

p 17.0

at year 4 it should be 2000 SV

n	B_{n-1}	D_n	B_n
1	10000	4000	6000
2	6000	2400	3600
3	3600	1440	2160
4	2160	160	2000
5	2000	—	2000

make change here → forcefully ghatauna

2 ma 80 80 ghatayera ni mulcha at no ichhana final year ma SV = BV chi huna paryo

If BV > S
(Switch from ~~BBD~~ DDB to SL)

$D_n = \frac{\text{B.V at begin.} - SV}{\text{Remaining useful life at begining of year}}$

P = Rs 10,000   N = 5   S = 0

(DDB with SL)

$\alpha = \frac{2}{5} = 0.4$

$\alpha \times B_{n-1}$

n	B_{n-1}	D_n	B_n
1	10,000	4000	6000
2	6000	2400	3600
3	3600	1440	2160
4	2160	864	1296
5	~~3000~~ 1296	518.4	778

$B_n > S$

we have to use the switch fundamental to S2

BOX	S2 depth	DDB depth	Decision
1	$\frac{10,000 - 0}{5} = 2000$	< 4000	Do not switch
2	$\frac{6000 - 0}{4} = 1500$	< 2400	Do not switch
3	$\frac{3600 - 0}{3} = 1200$	< 1440	Do not switch
4	$\frac{2160 - 0}{2} = 1080$	> 864	Switch to S2

optimal year for switching is year 4

EOY	BV-1	BV	BV
1	10,000	4000	6000
2	6000	2400	3600
3	3600	1440	2160
4	2160	1080	1080
5	1080	1080	0
		↓	(SV = BV)
		SL depreciation	

Sinking fund method

→ Book value decreases at increasing rates with respect to the life of the asset.

Compute the depreciation and BV in each year using sinking fund depreciation method.

Cost of asset = 1
SV = 2000
Useful life =
interest rate

P-F

A = ( ) (

1st year depreci

The year but

A = (100 000 -

= 6504.227

Dep at the end of 1

1 1

EOY	Dep (A
1	6504
2	
3	
4	
5	
6	
7	
8	

Cost of asset = 100000

SV = 20000

Useful life = 8 yrs

interest rate = 12%

P-F (2-5)

A = ( ) (A|F, 12%, 8 yrs)

1st year depreciation amount

2nd yea bat 12% te badhkai janche

$$A = (100000 - 20000)\left[\frac{0.12}{1.12^8 - 1}\right]$$

$$= 6504.227$$

Dep at the end of 1st year = 6504

" " 2nd year = 6504 × 1.12

= 7284.48

3rd year = 8158.6176

EOY	Dep (A)
1	~~6504.227~~ 6504
2	7284.48
3	8158.61
4	9137.65
5	10234.17
6	11462.27
7	12837.74
8	14378.27

Now,

For	Bn-1	Dn	Bn
1	100000	6504	93496
2	93496	7284.89	86211.52
3	86211.52	8158.61	78052.91
4	78052.91	9137.65	68915.26
5	68915.26	10234.17	58681.12
6	58681.12	11462.27	47218.85
7	47218.85	12837.74	34381.11
8	34381.11	14378.27	20002.84
			≈ 20,000

SV = SV

* Considering the
the annual
of each year

c) SL method
method

Cost basis

$7000

Sol

① SL Bn-1

8 year

1	70
2	60
3	50
4	40
5	30

(n)

* Considering the following information compute the annual depreciation and book value of each year by

(a) SL method (b) DB method (c) SOYD method and (d) sinking fund method

cost basis	SV	n	MARR
$7000	$2000	5 yrs	10%

Soln

(a) SL

year	B_{n-1}	D_n	B_n
1	7000	1000	6000
2.	6000	1000	5000
3	5000	1000	4000
4	4000	1000	3000
5	3000	1000	2000

(BV=SV)

(b)

DB $\alpha = \frac{2}{5} = 0.4\%$

Year	B_{n-1}	D_n	B_n
1	7000	2800	4200
2	4200	1680	2520
3	2520	1008	1512
4	1512	604.8	907.2
5	907.2	362.88	544.32

$B_n < SV$

Year	B_{n-1}	D_n	B_n
1	7000	2800	4200
2	4200	1800	5220
3	2520	173.33	2346.67
4	2346.67	173.33	2173.34
5	2173.34	173.33	2000

SOYD

$SOYD = \frac{N(N+1)}{2} = 15$

year	B_{n-1}	$D_n = \left(\frac{N-n+1}{SOYD}\right)(P-S)$	B_n
1	7000	1666.67	5333.33
2	5333.33	1333.33	4000
3	4000	1000	3000
4	3000	666.67	2333.33
5	2333.33	333.33	2000
			(BV = SV)

(c) Sinking fund method

$$A = (P-F)(A/F, 10\%, 5)$$

$$= (7000-2000)\left(\frac{0.1}{1.1^5-1}\right)$$

$$= 818.987$$

year	B_{n-1}	D_n	B_n
1	7000	818.987	6181.013
2		900.886	5280.127
3		990.974	4289.153
4		1090.07	3199.083
5		1199.07	2000

BV = SV) #

(Modified Accelerated Cost Recovery System)

MACRS Depreciation

→ In US ACRS is launched from 1981 and from 1986 MACRS is implemented.

→ It is a principle method for computing depreciation / deduction

→ The SV to be defined is zero and useful life estimates are not used directly in calculating depreciation amount

→ It includes eight categorized of assets and supposed useful life of 3 yrs, 5 yrs, 10, 15, 20, 27.5 and 39 yrs.

Half year convention of MACRS

→ Assumes all the asset are placed in service at mid so only half of the years depreciations being taken in 1st year.

→ MACRS assets is depricated initially by declining Balance method then by S.L method.

A tax payer wants to place in service Rs 10,000 assets that is assigned to 5 years class. Compute the MACRS % and depreciation amount for the assets.

N = 5 yrs , BR DDB = $\frac{2}{5}$ = 40 %

year	Calculation %	MACRS %	Decision
1	BD = $\frac{1}{2}$ × 40% (half year, 1st year ko half)	20%	
2	DB = 0.4 (100-20) %	32%	Do not switch
	SL = $\frac{1}{4.5}$ (100-20) % (1 year bacha bata)	17.78%	
3	BD = 0.4 (100-20-32)	19.2 %	No
	SL = $\frac{1}{3.5}$ (100-52)	13.7%	switch
4	DB = 0.4 (100-52-19.2)	11.52%	switch to SL
	SL = $\frac{1}{2.5}$ (100-52-19.2)	11.52%	
5	SL = $\frac{1}{1.5}$ (100-83.72)	11.52 %	directly taking micha
6	11.52 × 0.5 = 5.76 (calc chaile garne ni nunchha)		

(8) For now remaining 6 month

$$= \frac{1}{2} \times 11.52$$

$$= \boxed{5.76\ \%}$$

Dep^n basis

n	%	~~Dep basis~~	Dep Amount
1	20%	10,000	2000
2	32	10,000	3200
3	19.2	10,000	1920
4	11.52	10,000	1152
5	11.52	10,000	1152
6	5.76	10,000	576

Dep schedule

n	Bn-1	Dn	Bn
1	10,000	2000	8000
2	8000	3200	4800
3	4800	1920	2880
4	2880	1152	1728
5	1728	1152	576
6	576	576	0

Tax

→ Taxes are compulsory payment to government without exception of expectation of direct benefit in return to the tax payed.

Types of Taxes

① Direct tax

→ The tax which cannot be shifted to other is called direct tax. These taxes are also known as personal tax. For example income tax, property tax, house rent tax, land tax etc.

② Indirect tax

→ The tax is legally imposed on one person but is actually paid by another person is called indirect tax. These taxes are also known as impersonal taxes for example VAT, custom duties, excise tax etc.

Introduction to corporate income tax

① Income tax: income tax are assets as a function of gross revenue minus allowable reduction.

② property tax: Are assessed as a function of the value of property owned such as land, building, equipment.

③ sales tax: are assessed as the basis of purchase of goods and or services.

Taxable income = Gross income (revenue) - all expenses except capital investment - depreciable deducing.

Net income after tax (NIAT) = net income before tax (NIBT) - Income tax

Income tax = Tax rate x taxable income

taxable income - income tax = net income

Company buys a machine for Rs 28000 and use for 5yrs depreciation for 1st yr is Rs 4000 suppose company estimated following revenue and expenses.

Gross income = Rs 50,000
cost of good sold (expenses) = Rs 20,000
operating expenses = Rs 6000
What is the net income for the 1st years

If the tax r

Taxable income
expenses exc
depreciable

= 50,000 -
= 20,000

40% of 20,

net income =

General procedur
Economic analys

RK = Revenue
EK = Expenses
dK = Depreciation
during period
t = income ta

Taxable inome =
Tax amount (Tk

BTCFK = RK - E

ATCFK = BTCF

If the tax rate is 40%.

Taxable income = Gross income - all expenses except capital investment - depreciable deducing

= $50,000 - 20,000 - 6,000 - 4,000

= 20,000

40% of 20,000 = 8000

net income = 20,000 - 8000 = 12,000

* General procedures for making After tax Economic analysis

R_k = Revenue from the project during k

E_k = Expenses from the project during period k

d_k = Depreciation amount of the project during period k.

t = income tax rate

Taxable income = $R_k - E_k - d_k$

Tax amount $(T_k) = t\ (R_k - E_k - d_k)$

$BTCF_k = R_k - E_k$

$ATCF_k = BTCF_k - T_k$

$= R_k - K_k - t(R_k - E_k - d_k)$

$= (1-t)(R_k - E_k) + t d_k$

Tabular form to compute ATCFs

Year	BTCF	Depreciation	Taxable income	Tax amount
				tx
k	$R_k - E_k$	d_k	$BTCF - d_k$	$(R_k - E_k - d_k)$

$ATCF = BTCF - \text{Tax amount}$

$(1-t)(R_k - E_k) + t d_k$

Suppose an asset has purchased for Rs 1,00,000. It is expected to produce net cash inflows of Rs 30,000 per year and effective income tax is 40%. Under the recovery period. The amount of MACRS depreciation are as follows.

year	1	2	3	4	5	6
Depreciation	10000	20000	20000	20000	20000	10000

Calculate ATCFs and determine profitability when MARR = 10% by using pw method also calc IRR.

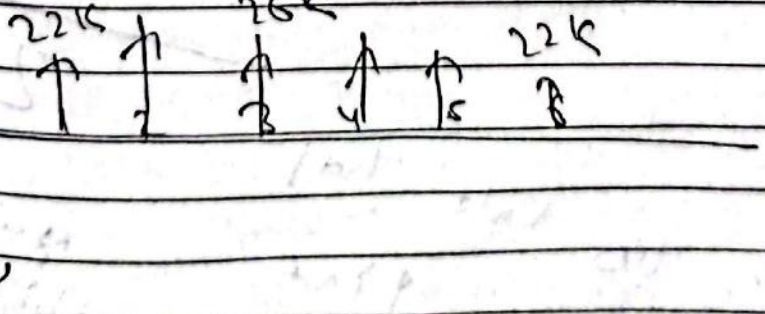
Soln:

Expenses = 0 in this

10%

$E = A \cdot b$

EOY	A BTCF	B Dep^n	C = A − B Taxable income	D = tax C tax	AECF
0	−100,000	0	−100,000	—	−100,00
1	30,000	10000	20000	8000	22,000
2	30,000	20000	10000	4000	26,000
3	30,000	20000	10000	4000	26,000
4	30,000	20000	10000	4000	26,00
5	30,000	20000	10000	4000	26,00
6	30,000	10000	20000	8000	22,000



$PW = 7342.51$

To find IRR

$-100000 + 22000(1+i)^{-1} + 22000(1+i)^{-2}$

$+ 26000 \left[\frac{(1+i)^4 - 1}{i \times (1+i)^4}\right] \times (1+i)^{-1}$

$i = 12.5\%$

IRR = 12.5% > MARR #

Kunai Qn ma MA CRS
ko sab nikalnu
garnu hundaina
parcha

Aesma BTCF

1st

ra last year ko half hal

garna nabirsinu

CamScanner