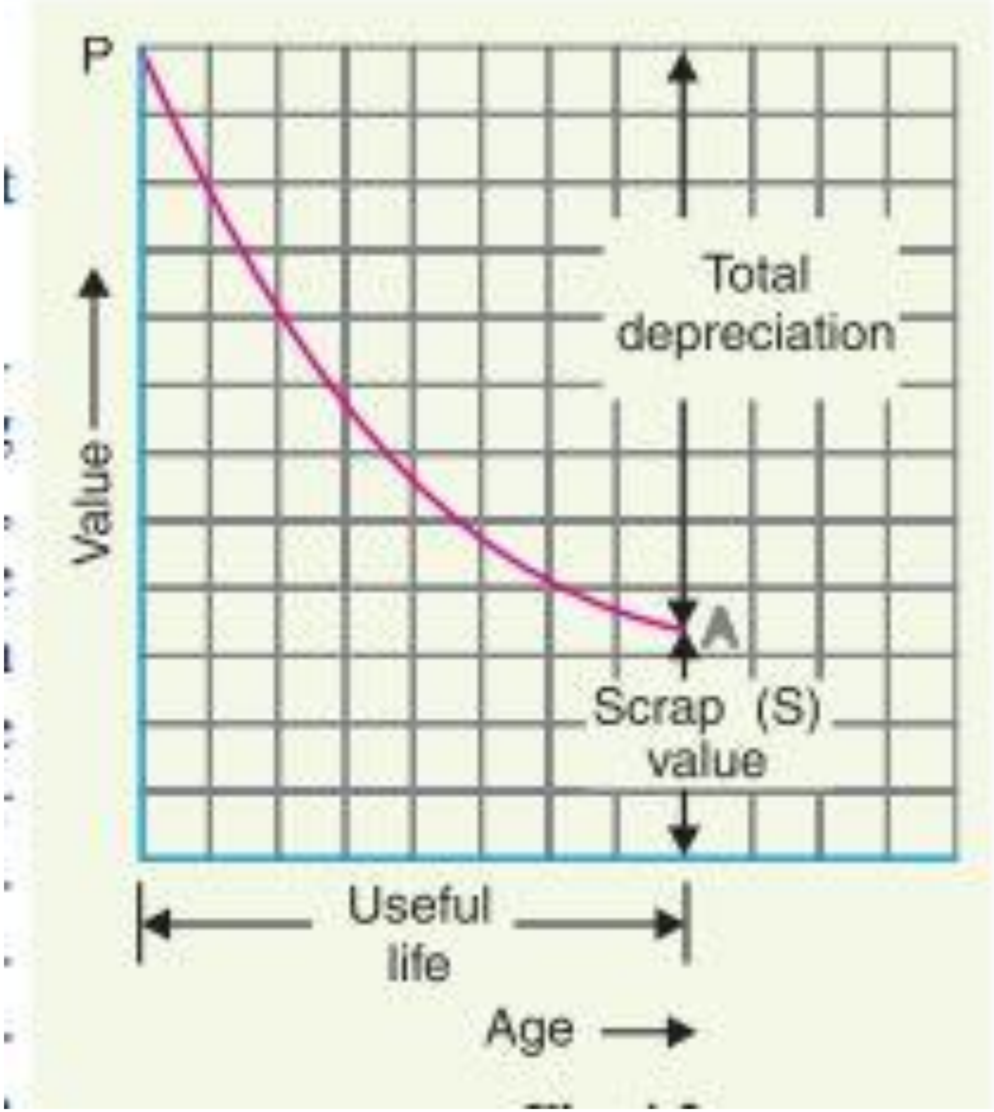

P
Value
Total depreciation
A
Scrap (S) value
Useful life
Age

(iii) Sinking fund method.

In this method, a fixed depreciation charge is made every year and interest compounded on it annually. The constant depreciation charge is such that total of annual instalments plus the interest accumulations equal to the cost of replacement of equipment after its useful life. Let P = Initial value of equipment n = Useful life of equipment in years S = Scrap value after useful life r = Annual rate of interest expressed as a decimal Cost of replacement = P − S Let us suppose that an amount of q is set aside as depreciation charge every year and interest compounded on it so that an amount of P− S is available after n years. An amount q at annual interest rate of r will become *q(1 + r) n at the end of n years. Now, the amount q deposited at the end of first year will earn compound interest for n − 1 years and shall become q(1 + r) n − 1 i.e., Amount q deposited at the end of first year becomes = q (1 + r) n − 1

Amount q deposited at the end of 2nd year becomes = q (1 + r) n − 2

Amount q deposited at the end of 3rd year becomes = q (1 + r) n − 3

Similarly amount q deposited at the end of n − 1 year becomes = q (1 + r) n − (n − 1) = q (1 + r) ∴

Total fund after n years = q (1 + r) n − 1 + q (1 + r) n − 2 + ... + q (1 + r) = q [(1 + r) n − 1 + (1 + r) n − 2 + ... + (1 + r)]

This is a G.P. series and its sum is given by : Total fund = q r r n ( ) 1 + −1 This total fund must be equal to the cost of replacement of equipment i.e., P − S. ∴ P − S = q r r n ( ) 1 + − 1 or Sinking fund, q = ( ) ( ) P S r r n − + − L N M O Q 1 1P ...(i) The value of q gives the uniform annual depreciation charge. The paraenthetical term in eq. (i) is frequently referred to as the "sinking fund factor". ∴ Sinking fund factor = r r n (1 + −) 1

. A transformer costing Rs 90,000 has a useful life of 20 years. Determine the annual depreciation charge using straight line method. Assume the salvage value of the equipment to be Rs 10,000.

Solution : Initial cost of transformer, P = Rs 90,000

Useful life, n = 20 years

Salvage value, S = Rs 10,000

Using straight line method, Annual depreciation charge = P –S/ n − = − Rs 90 000 -10 000/ 20 , , = Rs 4000

A distribution transformer costs Rs 2,00,000 and has a useful life of 20 years. If the salvage value is Rs 10,000 and rate of annual compound interest is 8%, calculate the amount to be saved annually for replacement of the transformer after the end of 20 years by sinking fund method.

Solution : Initial cost of transformer, P = Rs 2,00,000

Salvage value of transformer, S = Rs 10,000

Useful life, n = 20 years

Annual interest rate, r = 8% = 0·08

Annual payment for sinking fund,

q = (P − S) r r n ( ) 1 1 + − L N M O Q

P = (2,00,000 − 10,000) 0 08 1 0 08 1 20 · +· − L N M O Q P ( )
= 1,90,000 0 08 4 66 1 · · − L N M O Q
P = Rs 4153

. The equipment in a power station costs Rs 15,60,000 and has a salvage value of Rs 60,000 at the end of 25 years. Determine the depreciated value of the equipment at the end of 20 years on the following methods : (i) Straight line method ; (ii) Diminishing value method ; (iii) Sinking fund method at 5% compound interest annually.

Importance of High Load Factor

The load factor plays a vital role in determining the cost of energy. Some important advantages of high load factor are listed below :

(i) Reduces cost per unit generated :

A high load factor reduces the overall cost per unit generated. The higher the load factor, the lower is the generation cost. It is because higher load factor means that for a given maximum demand, the number of units generated is more. This reduces the cost of generation.

(ii) Reduces variable load problems :

A high load factor reduces the variable load problems on the power station. A higher load factor means comparatively less variations in the load demands at various times. This avoids the frequent use of regulating devices installed to meet the variable load on the station.

TERMS AND DEFINITIONS

Connected Load

The connected load on any system, or part of a system, is the combined continuous rating of all the receiving apparatus on consumers' premises, which is connected to the system, or part of the system, under consideration.

Demand

The demand of an installation or system is the load that is drawn from the source of supply at the receiving terminals averaged over a suitable and specified interval of time. Demand is expressed in kilowatts (kW), kilovolt-amperes (kVA), amperes (A), or other suitable units.

Maximum Demand or Peak Load

The maximum demand of an installation or system is the greatest of all the demands that have occurred during a given period. It is determined by measurement, according to specifications, over a prescribed interval of time.

Demand Factor

The demand factor of any system, or part of a system, is the ratio of maximum demand of the system, a part of the system, to the total connected load of the system, or of the part of the system, under consideration. Expressing the definition mathematically, Maximum demand Demand factor = Connected load . .