

Binary Trees



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Important Formulas

Formula-1:

Minimum number of nodes in a binary tree of height 'H'

$$= H + 1$$

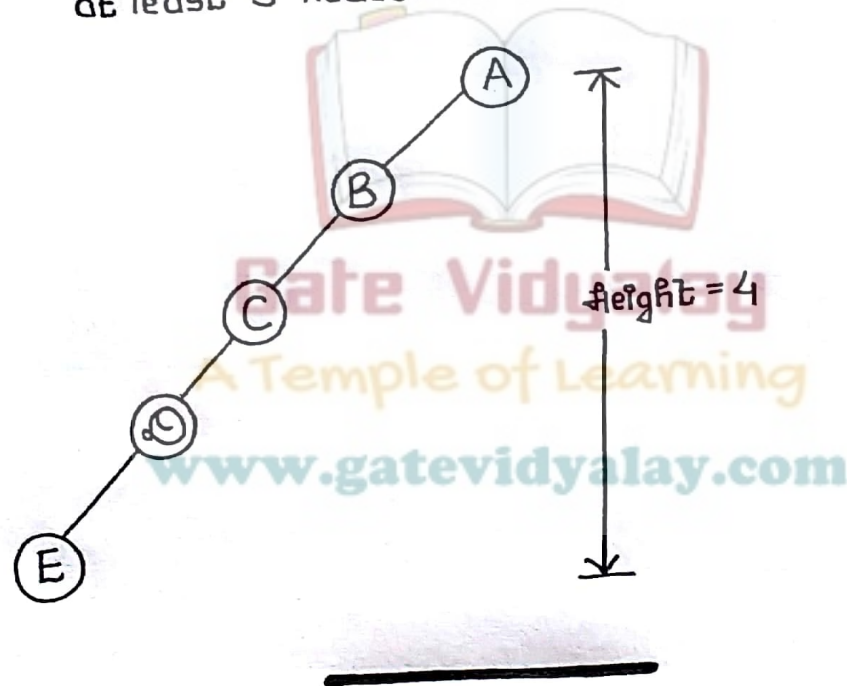
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Example:

To construct a binary tree of height '4' we need at least 5 nodes.

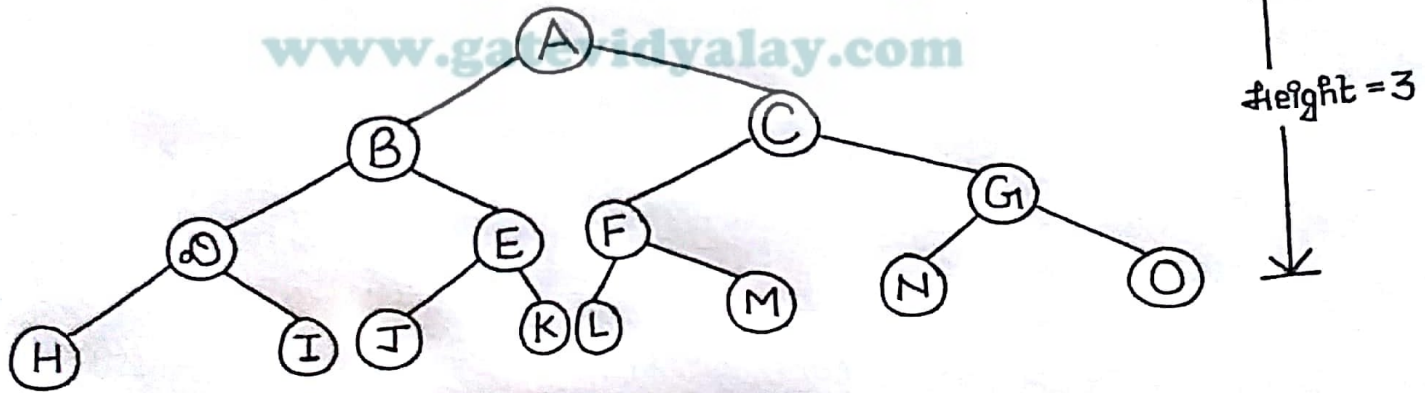


Formula-2:

Maximum number of nodes in a binary tree of height 'h'
 $= 2^{h+1} - 1$

Example:

Maximum number of nodes in a binary tree of height '3'
 $= 2^{3+1} - 1$
 $= 15$

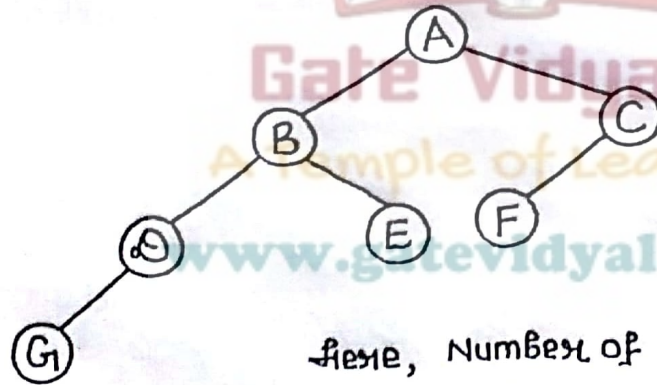


Formula-3:

$$\text{Total number of leaf nodes in binary tree} = \text{Total number of degree-2 nodes} + 1$$

Example:

Consider the following binary tree -



Here, Number of leaf nodes = 3

Number of degree-2 nodes = 2

This verifies the above relation.

Formula-4:

$$\begin{aligned} \text{Maximum number of nodes at any level 'L'} \\ = 2^L \end{aligned}$$

Example:

$$\begin{aligned} \text{Maximum number of nodes at level '2'} \\ = 2^2 \\ = 4 \end{aligned}$$

