**Southern Technical University Technical Institute / Ourna Dep. of Computer Systems Techniques** 

Second class Subject : Data Structures Lecturer : Israa Mahmood Hayder Lecture no.19

# مياكل البيانات اللخطية (الاشجار)

(Trees)

- الاسبوع التاسع عشر -

\* تحويل الأشجار العامة إلى ثنائية. - تطبيقات الأشجار trees applications.



#### -: ( مبررات الوحدة ) B// Rationale

A binary tree is a tree where each node has exactly zero, one or two children. i.e. each parent can have no more than 2 children. As with any Abstract Data Structure we can implement a binary tree in a number of ways, using arrays, strings, or structures and pointers. Trees and binary trees have many applications in computers and programming languages.

## <u>-:(الفكرة المركزية) -:(الفكرة المركزية)</u>. •Converting normal to binary tree

- Tree applications

#### -:( أهداف الوحدة) Objectives -:

After studying this unit, the student will be able to:-

- Convert the tree to binary tree -
- Study about some trees applications.

## **1// Convert Normal Tree to Binary:**

- The root of the normal tree is the root in binary tree.
- left branch remain left.
- Right branch will be right branch to the next node on the right.





Convert the following tree to binary



## 2// Tree Applications:

Compiling programs is a complex task:

- All Statements have a fixed form (syntax)
- Statements can be ordered and nested almost arbitrarily

•The compiler generates syntax trees that represent programs.

• The process of building a syntax tree is called *parsing*.

•After the syntax tree is built, the tree is traversed and for each node code is generated.

### a- A Syntax Tree

Consider the C++ statement:

if (a == b + 1) x = y; else ...



A binary expression tree is a syntax tree used to represent the meaning of a mathematical expression.

- Nodes are normal arithmetical operators such as + / \*
- Leaves are operands
- Structure of the tree defines result

Expression can be evaluated easily from their binary expression tree.

#### **b-Binary Expression Trees**







- 1- Data Structures Demystified, by Jim Keogh and Ken Davidson, ISBN:0072253592, McGraw-Hill/Osborne © 2004
- هياكل البيانات / الطبعة الثانية، تاليف د عصام الصفار، اصدارات السفير للنشر / بغداد، ٢٠٠١ -2