

**FACULTY OF ENGINEERING**

**COMPUTER SYS. ENGINEERING DEPARTMENT**

**Data Structure & Algorithms**

**Homework #3**

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1. **Page 85, Question 3.7-a (form our book):**

Let N= the number of nodes

F= the number of full nodes

L= the number of leaves

H= the number of nodes with one child (half child)

* The total number of nodes in a binary tree:

N = F + L + H… -> 1

* Because each full node is incident on two outgoing edges, each half node is incident on one outgoing edge and each leaf is incident on no outgoing edges. Then, the total number of edges in a binary tree is 2F + H; it also equals N - 1.
* 2F + H = N – 1

H = N – 1 – 2F

By substitution in 1:

N = F + L + (N – 1 – 2f)

N – N + 1 = -F + L

F + 1 = L ……… -> This is what to be shown

1. **Page 139, Question 4.6. (From our book):**

typdef struct node {

int coeff;

int power;

struct node \*next;

}

\*node pMult (node \* p1, node \* p2) {

node p3, \*ptr1, \*ptr2, \*ptr3 ;

p3 . next = NULL ;

for (ptr1 = p1 ; ptr1 ; ptr1 = ptr1 -> next)

for (ptr2 = p2; ptr2; ptr2 = ptr2 -> next) {

ptr = (node \*) malloc (sizeof (node));

ptr -> coeff = ptr1 -> coeff \* ptr2 ->coeff ;

ptr -> power = ptr1 -> power \* ptr2 -> power;

}

return p3.next;

}

1. **What is the minimum number of keys in a B-tree of order m and height h? Give an example for m=21 and h=11.**

* The minimum number of keys =

2 ( m / 2 )h – 1

* Let m = 21 & h = 11:

The min. number of keys = 2 ( 21 / 2 )11 – 1 = 3 \* 1011 key

1. **What is the maximum number of keys in a Btree of order m and height h? Give an example for m=21 and h=11.**

* The maximum number of keys =

mh

* Let m = 21 & h = 11:

The max. number of keys = 2111 = 3 \* 1014 key