PROGRAMMING ASSIGNMENT # 7

Spring Semester **CSC 36000** **Date: April 13, 2015**

PROGRAM STATEMENT: For your seventh programming assignment, you are to write a program that employs a Binary Tree to store and print information on a store's data base inventory. The program is due on **April 27, 2015**.

INPUT: Input for this program will be in the form of a command followed by the information needed to execute the command. The general format for input will be **Command Code <Information>.** Specifically, the command code will be a single character indicating which of six command types is to be executed. The commands and their codes are:

I - Insert information(a node)into the tree using "InOrder" construction.
D - Delete information(a node)from the tree.
P - Print the contents of the tree or an individual item.
S - Adjust the quantity of inventory on hand due to a sales transaction.
O - Adjust the quantity of inventory on order due to a restock transaction .
R - Adjust both quantities to reflect a shipment of items received.

The format for each type of command will be:

1) For **I** -- ID(5 char) Name(20 char) Quantity On Hand Quantity On Order
2) For **D** -- ID(5 char) Name(20 char)
3) For **P** -- Type of print <**E** for entire tree> or <**N ID** for individual item>
4) For **S** -- ID Quantity Sold
5) For **O** -- ID Quantity Ordered
6) For **R** -- ID Quantity Received

Quantities are of integer type. A command code of **Q** signifies the end of the input data. The name of the data file is **tree.in. (NB: There may be white space/blacks in the name of the item. For example: Opal Ring)**

PROCESSING: The program is to use a binary tree data structure to store the data. Each time an **I** is read, the data item is to be added to the tree structure keeping the tree sorted, A-Z, for **INORDER TRAVERSALS**. The tree is to be kept sorted by ID number. Each time a **D** is read, the program is to search the tree and delete the node in question from the tree. A **P** means that the tree is to be printed IAW the instructions below. An **S** indicates that the on-hand inventory count is to be reduced due to sales activities, an **R** means that all or part of an inventory order has been received and that the quantity indicated needs to be transferred from the "On Order" category to the "On Hand" category. Finally, a code of **O** means the on-order inventory count is to be increased due to restocking activities. You may assume that if the operation is an **S** that there are enough items in the inventory to handle the transaction. **As in past programs you must guard against adding duplicate items and insure that you do not attempt to delete or change a nonexistent item.**

OUTPUT: Each line of input is to be processed according to the command code at the beginning of each line. The ONLY time that your program is to generate a printout of the tree's contents is when the command code is a **P** . When the code is a **P**, your program is to print out either the entire tree using INORDER TRAVERSAL or an individual item depending on the secondary code of **E** or **N**. **A separate page of output is to be generated only for each print command of the entire tree.** When printing the entire tree, you are to include the same output heading on each page so any employee can tell what the output means. The heading is shown below. *(NOTE: Actual column spacing is at your discretion but all data must be properly aligned.)*:

JAKE'S HARDWARE INVENTORY REPORT

Item ID Number	**Item Description**	**Quantity On hand**	**Quantity On Order**

When printing individual processing messages, you are to include them on the same page. Each processing message is to be separated by a row of 60 dashes (-) . For each transaction, you are to print one of the following messages indicating the results of the transaction with the **ID** number or an error message with the item **ID** number included. The message are:

For successful insertion: Item ID Number <actual ID #> successfully entered into database.
For unsuccessful insertion: ERROR - Attempt to insert a duplicate item (<actual ID #>) into the database.

For successful deletion: Item ID Number (<actual ID #>) successfully deleted from database.
For unsuccessful deletion: ERROR --- Attempt to delete an item (<actual ID #>) not in the database list.

For successful updating: Quantity on Hand for item (<actual ID #>) successfully updated. OR
Quantity on Order For item (<actual ID #>) successfully updated.
For unsuccessful updating: Item (<actual ID #>) not in database. Data not updated.

For unsuccessful printing: Item (<actual ID #>) not in database. Print failed.

PROGRAM SAMPLE DATA: The data file name will be **tree.in**. You can use the following sample data to test your program.

```
I
OP123
Opal Ring
201  99
I
FH473
Fur Hat
750  250
I
RB902
Ruby Ring
280  75
I FC881
Fur Coat
600  125
I
DP721
Diamond Pendant
92   11
P
E
S
FH473
100
I
RB702
Ruby Necklace
110  40
P
N
FH473
S
DP721
4
O
RB902
50
P
E
I
RE702
Ruby Earrings
100  35
D
DN022
Diamond Necklace
R
RB902
15
D
OP123
Opal Ring
D
DE456
Diamond Earrings
S
HF473
7
I
EM543
Emerald Bracelet
0    100
```

D
DR356
Diamond Ring-1.5
D
FH473
Fur Hat
P
E
X

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EXAMPLE INPUT: As shown on the last page in the sample.

EXAMPLE OUTPUT:

```
Item ID Number OP123 successfully entered into database.
---------------------------------------------------------------
Item ID Number FH473 successfully entered into database.
---------------------------------------------------------------
Item ID Number RB902 successfully entered into database.
---------------------------------------------------------------
Item ID Number FC881 successfully entered into database.
---------------------------------------------------------------
Item ID Number DP721 successfully entered into database.
---------------------------------------------------------------
----------  NEW PAGE  ----------  NEW PAGE  ----------  NEW PAGE  ----------
    Item         Item                Quantity     Quantity
   ID Number    Description          On Hand      On Order
---------------------------------------------------------------
   DP721        Diamond Pendant        92           11
   FC881        Fur Coat              600          125
   FH473        Fur Hat               750          250
   OP123        Opal Ring             201           99
   RB902        Ruby Ring             280           75
----------  NEW PAGE  ----------  NEW PAGE  ----------  NEW PAGE  ----------
ERROR --- Attempt to insert a duplicate item (RB902) into the database.
---------------------------------------------------------------
    Item         Item                Quantity     Quantity
   ID Number    Description          On Hand      On Order
---------------------------------------------------------------
   FH473        Fur Hat               650          250
----------  NEW PAGE  ----------  NEW PAGE  ----------  NEW PAGE  ----------
    Item         Item                Quantity     Quantity
   ID Number    Description          On Hand      On Order
---------------------------------------------------------------
   DP721        Diamond Pendant        88           11
   FC881        Fur Coat              600          125
   FH473        Fur Hat               650          250
   OP123        Opal Ring             201           99
   RB902        Ruby Ring             280          125
----------  NEW PAGE  ----------  NEW PAGE  ----------  NEW PAGE  ----------
Item ID Number RE702 successfully entered into database.
---------------------------------------------------------------
ERROR --- Attempt to delete an item (DN022) not in the database list.
---------------------------------------------------------------
Item ID Number RB902 successfully updated with 15 items added
to the database.
---------------------------------------------------------------
Item ID Number OP123 successfully deleted from database.
---------------------------------------------------------------
ERROR --- Attempt to update sales record for an item not in
database.  ID number HF473 not in the database list.
---------------------------------------------------------------
Item ID Number EM543 successfully entered into database.
---------------------------------------------------------------
Item ID Number FH473 successfully deleted from database.
---------------------------------------------------------------
----------  NEW PAGE  ----------  NEW PAGE  ----------  NEW PAGE  ----------
    Item         Item                Quantity     Quantity
```

ID Number	Description	On Hand	On Order
DP721	Diamond Pendant	88	11
EM543	Emerald Bracelet	0	100
FC881	Fur Coat	600	125
FH473	Fur Hat	750	250
RB702	Ruby Necklace	200	80
RB902	Ruby Ring	265	115

END OF OUTPUT