An RBT Tree Class
Rough Draft

The RBT tree module

Here is a conforming *rbt.h* file:

```
/*** RBT binary search tree class ***/

#ifndef __RBT_INCLUDED__
#define __RBT_INCLUDED__

#include <stdio.h>
#include "tnode.h"

typedef struct rbt RBT;

extern RBT    *newRBT(int (*c)(void *,void *));
extern void    setRBTdisplay(void (*d)(void *,FILE *));
extern void    setRBTswapper(void (*s)(TNODE *,TNODE *));
extern void    setRBTfree(void (*)(void *));
extern TNODE *getRBTroot(RBT *t);
extern void    setRBTroot(RBT *t,TNODE *replacement);
extern void    setRBTsize(RBT *t,int s);
extern TNODE *insertRBT(RBT *t,void *value);
extern void  *findRBT(RBT *t,void *key);
extern TNODE *locateRBT(RBT *t,void *key);
extern int     deleteRBT(RBT *t,void *key);
extern TNODE *swapToLeafRBT(RBT *t,TNODE *node);
extern void    pruneLeafRBT(RBT *t,TNODE *leaf);
extern int     sizeRBT(RBT *t);
extern void    statisticsRBT(RBT *t,FILE *fp);
extern void    displayRBT(RBT *t,FILE *fp);
extern int     debugRBT(RBT *t,int level);
extern void    freeRBT(RBT *t);
extern void  *getRBTvalue(TNODE *n);
extern int     freqRBT(RBT *g,void *key);
extern int     duplicatesRBT(RBT *g);

#endif
```

The methods of the *RBT* class are similar to those of the *GST* class. As always, your implementations should equal that of a professional computer scientist.

You will store *RBT* values into a *GST* object. These values will store the generic values to be inserted into the red-black tree and the colors of the tree nodes.

To swap RBT values, a swapper function is needed:

```
function swapper(TNODE *a,TNODE *b)
    {
    void *va = getTNODEvalue(a);
    void *vb = getTNODEvalue(b);
    // swap the GST values
    setTNODEvalue(a,vb);
    setTNODEvalue(b,va);
    // the above swap swapped the colors,
    // but the colors should stay with the nodes,
    // so swap the colors back to the original nodes
    RBTVALUE *x = getGSTvalue(a);
    RBTVALUE *y = getGSTvalue(b);
    int color = x->color;
    x->color = y->color;
    y->color = color;
    }
```

The *swapper* function is passed to the *BST* via the *setBSTswapper* method.

The only local includes a *RBT* module should have are *rbt.h*, *bst.h*, and *tnode.h*.