

Câu 1 (3 điểm) : Sinh viên là câu $i = (\text{STT Mod } 3) + 1$.

Khai báo chung : `struct NODE { int key ; NODE *left; NODE * Right } ; NODE *Root, *p;`

a) Hãy vẽ cây từ chương trình sau :

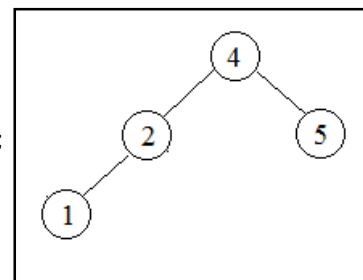
```
Root=(NODE *)malloc(sizeof(NODE)); Root->key=1; Root->left=NULL; Root->right=NULL;
```

```
p=(NODE *)malloc(sizeof(NODE)); p->key=2; p->left=Root; p->right=NULL; Root = p;
```

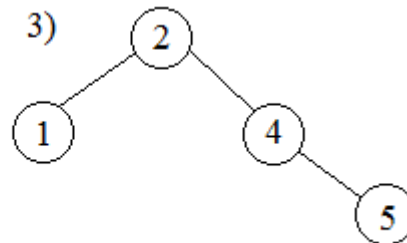
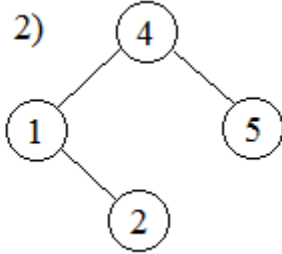
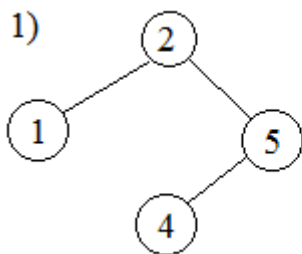
```
p=(NODE *)malloc(sizeof(NODE));p->key=4; p->left=Root ; p->right = NULL; Root = p;
```

```
p=(NODE *)malloc(sizeof(NODE)); p->key=5; p->left=NULL; p->right = NULL;
```

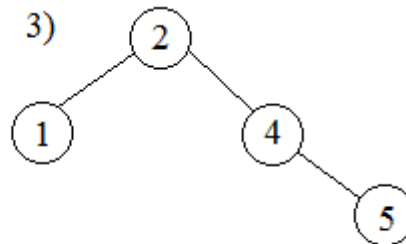
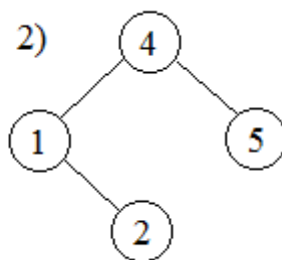
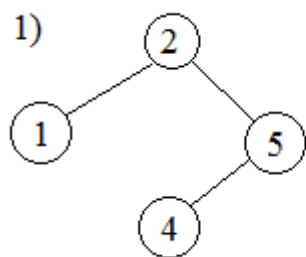
```
Root->right = p;
```



b) Hãy điền vào ô trống (____) của chương trình sau để có cây i)



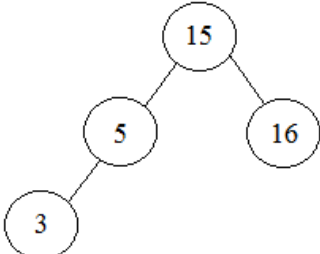
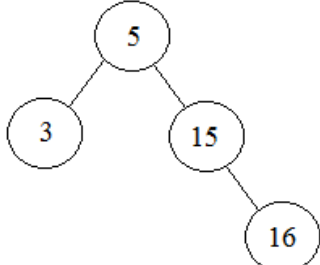
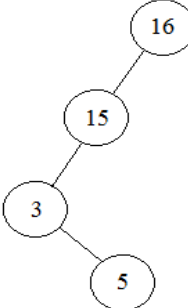
```
Root=(NODE *)malloc(sizeof(NODE));
Root->key= ____ ; Root->left=____; Root->right=____ ;
p=(NODE *)malloc(sizeof(NODE));
p->key= ____ ; p->left=____; p->right=____; ____ = p;
p=(NODE *)malloc(sizeof(NODE));
p->key= ____ ; p->left=____; p->right = ____; Root = p;
p=(NODE *)malloc(sizeof(NODE));
p->key= ____ ; p->left=____; p->right = ____; Root->____ = p;
```



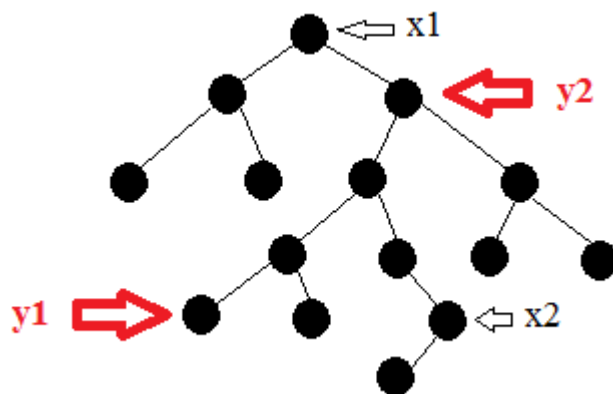
1)	2)
<pre>Root=(NODE *)malloc(sizeof(NODE)); Root->key= 4 ; Root->left= NULL; Root->right= NULL; p=(NODE *)malloc(sizeof(NODE)); p->key= 5 ; p->left= Root; p->right = NULL; Root = p; p=(NODE *)malloc(sizeof(NODE)); p->key= 2 ; p->left= NULL ; p->right = Root; Root = p; p=(NODE *)malloc(sizeof(NODE));</pre>	<pre>Root=(NODE *)malloc(sizeof(NODE)); Root->key = 2 ; Root->left = NULL; Root->right = NULL; p=(NODE *)malloc(sizeof(NODE)); p->key= 1 ; p->left= NULL; p->right = Root ; Root = p; p=(NODE *)malloc(sizeof(NODE)); p->key= 4 ; p->left=Root ; p->right = NULL; Root = p; p=(NODE *)malloc(sizeof(NODE));</pre>

p->key= 1 ; p->left= NULL ; p->right = NULL ; Root-> left = p;	p->key= 5 ; p->left= NULL ; p->right = NULL ; Root-> right = p;
3) Root=(NODE *)malloc(sizeof(NODE)); Root->key= 5 ; Root->left= NULL ; Root->right= NULL ; p=(NODE *)malloc(sizeof(NODE)); p->key= 4 ; p->left= NULL ; p->right = Root ; Root = p; p=(NODE *)malloc(sizeof(NODE)); p->key= 2 ; p->left= NULL ; p->right = Root ; Root = p; p=(NODE *)malloc(sizeof(NODE)); p->key= 1 ; p->left= NULL ; p->right = NULL ; Root-> left = p;	

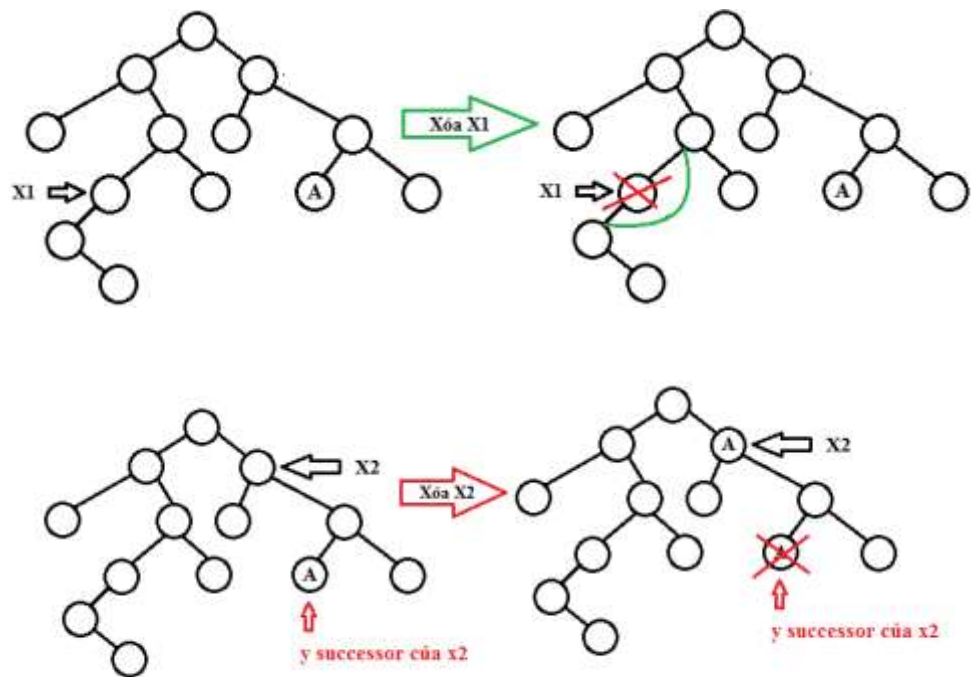
Câu 2 (2 điểm): Sinh viên là câu i = (STT Mod 3) + 1. Hãy vẽ cây BST khi thực hiện chương trình sau (Thủ tục và biến Root theo Slide bài học):

1) TREE_INSERT(&Root, 15); TREE_INSERT(&Root, 5); TREE_INSERT(&Root, 16); TREE_INSERT(&Root, 3);	2) TREE_INSERT(&Root, 5); TREE_INSERT(&Root, 15); TREE_INSERT(&Root, 16); TREE_INSERT(&Root, 3);	3) TREE_INSERT(&Root, 16); TREE_INSERT(&Root, 15); TREE_INSERT(&Root, 3); TREE_INSERT(&Root, 5);
		

Câu 3 (2 điểm) : cho cây BST . Hãy cho biết successor y1 của x1, successor y2 của x2 (Vẽ vào cây như x1, x2).



Câu 4 (2 điểm) : Cho cây BST



Câu 5 (1 điểm) : Cho cây Red_Black Tree. Vẽ cây kết quả khi xoay trái (Left rotate) tại z (xóa z).

