QUIZ 2
COMP6048 – Data Structures Even 2019 / 2020
VAR 6

Notes :

1. There are **2 parts** in this quiz, Essay and Case.
2. For essay problem:
   a. You are required to solve it using by ***handwritten on a paper***
   b. Subsequently, your essay answers ***should be converted in 1 pdf file*** using this format: ***nim.pdf***
   c. The lecturers won't accept any answers using word processing application in order to prevent copy-paste answers in a last minute
3. For case problem:
   a. ***The submission code is in .cpp file*** and using this format: ***nim.cpp***
4. All your answers ***either essay (nim.pdf) or case (nim.cpp) should be zipped and submitted through*** the platform that your lecturer set**.** Other than that, the submission won't be accepted for any reasons. ***(Note : Please zip both files using this format: nim.zip)***
5. **Your Quiz will be *marked as 0* if any *plagiarism is found***

I. Essay (60%)

When deleting, always take the replacement value from **leftmost** of **right** children.

Write down every step for insert and delete happen in all simulation tree below.

1. **[20%]** Given Red Black Tree in the figure 1 below:

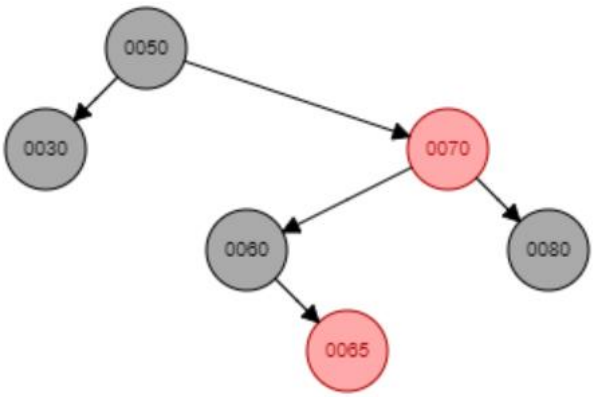

Figure 1Red Black Tree 1

a.**[10%]** Please insert the following numbers **68, 55, 20, 10** and **5** subsequently!

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Given Red Black Tree in the figure 2 below:

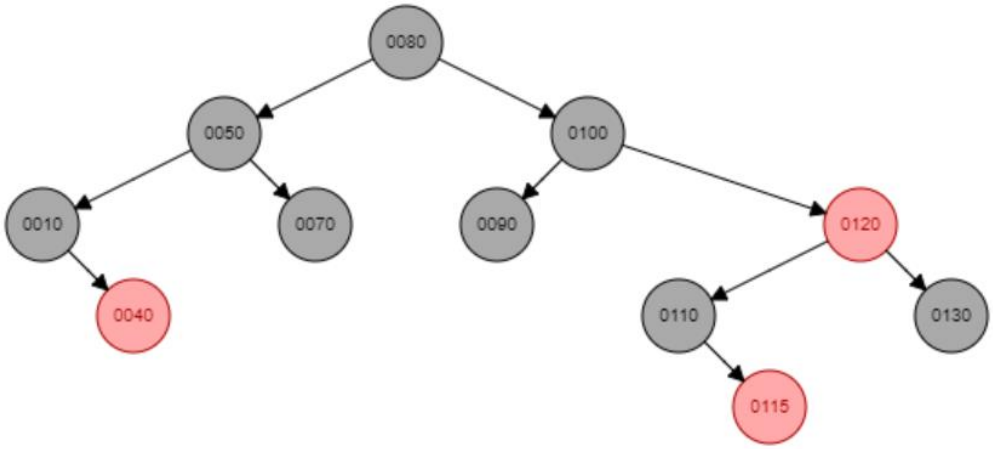

Figure 2 Red Black Tree 2

b. **[10%]** Please delete the following numbers: **100, 80, 70, 130** and **110** subsequently!

2. Given B-Tree order 3 in the figure 3 below:

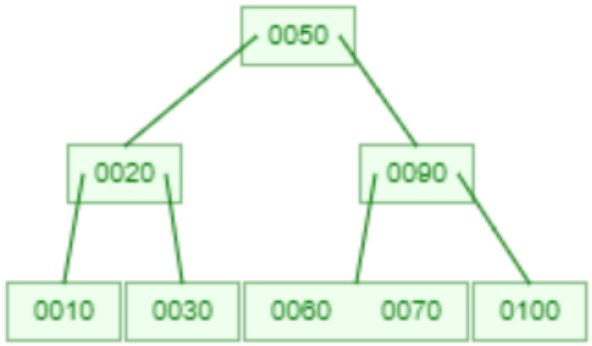

Figure 3 B-Tree Order 3 Ver 1

a. **[10%]** Please insert the following numbers : **80, 110, 120, 75** and **85** subsequently!

Given B-Tree order 3 in the figure 4 below :

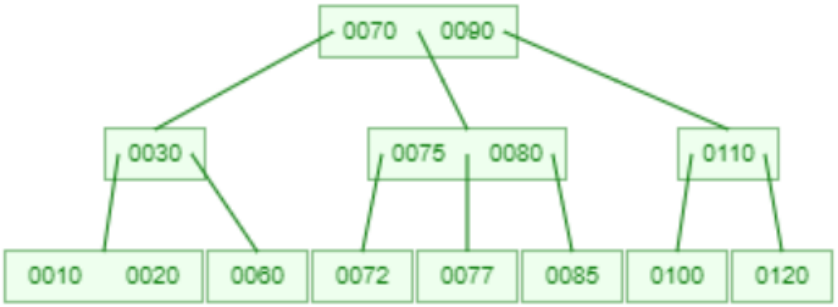

Figure 4 B-Tree Order 3 Ver 2

b. **[10%]** please delete the following numbers : **70, 60, 110, 75** and **80** subsequently!

3. **[20%]** Consider the graph given in Figure 5, find the shortest path from A to F using Dijkstra Algorithm. Write step by step using table and result from the table.

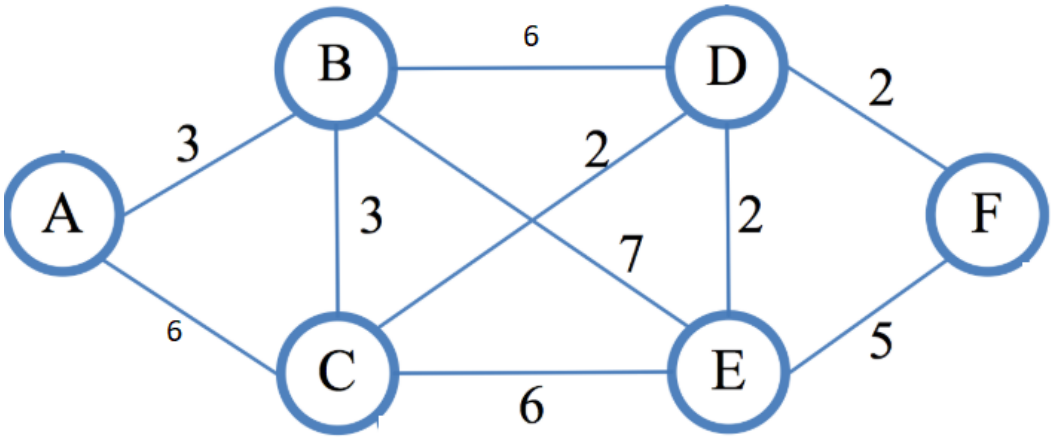

Figure 5 Graph

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II. Case (40%)

Create a program using AVL Tree concept to store data about student scores with the following conditions :

a. Program consists of **4 menu**:
   i. Insert student data
   ii. Remove student data
   iii. Search student
   iv. Exit

b. At the first, program will display **list of student scores**, **average score** and **menu** like figure 6

```
No. | Nim        | Name                | Score
=============================================
1 . | 1300030990 | Setiabudi           | 60
2 . | 1300030992 | Andi Setiawan       | 50
3 . | 1300030994 | John                | 70
4 . | 1300030996 | Tony Sutejo         | 90
5 . | 1300030998 | Karen Wijaya        | 80
=============================================
Average score : 70.00
=============================================

1. Input student data
2. Remove student data
3. Search student
4. Exit
input your choice : _
```

Figure 6 Menu

The following is the initial data in the program:

Table 1 Initial Data

No	Nim	Nama	Score
1	1300030990	Setiabudi	60
2	1300030992	Andi Setiawan	50
3	1300030994	John	70
4	1300030996	Tony Sutejo	90
5	1300030998	Karen Wijaya	80

Insert all data above into the program sequentially.

Program will display list of student scores that stored in AVL Tree sorted by nim ascending.

Program will always **update list of data** and **average score** after user input new data (menu 1) or remove data (menu 2).

c. If user choose **menu 1** (Input student data), the program will :
   - Ask user to input student nim, **validate nim must be 10 numbers and unique**. If nim already existed in the data, display message "Nim already existed"
   - Ask user to input student name, **validate name must be between 3 and 20 characters**
   - Ask user to input student score, **validate socre must be between 0 and 100**
   - After all data correct, add the data to AVL Tree

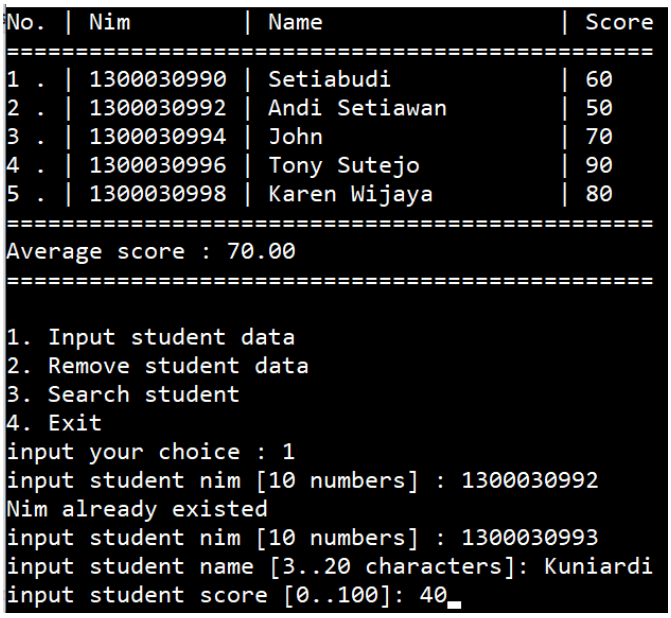

Figure 7 Input Student Data Menu

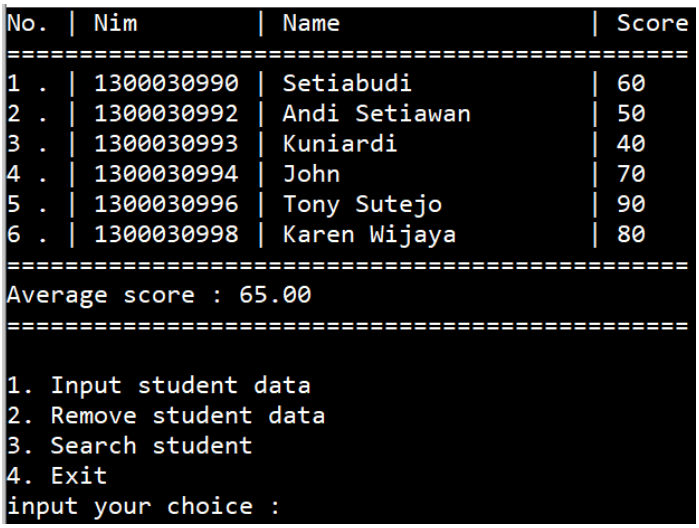

Figure 8 Successfully Insert Data

d. If user choose **menu 2** (Remove student data), the program will :

- Ask user to input student nim
- If nim is not existed in the data, display message “data is not found”
- If nim is existed, display message “Data successfully deleted” and remove the data from AVL Tree

```
No. | Nim        | Name                | Score
=============================================
1 . | 1300030990 | Setiabudi           | 60
2 . | 1300030992 | Andi Setiawan       | 50
3 . | 1300030993 | Kuniardi            | 40
4 . | 1300030994 | John                | 70
5 . | 1300030996 | Tony Sutejo         | 90
6 . | 1300030998 | Karen Wijaya        | 80
=============================================
Average score : 65.00
=============================================

1. Input student data
2. Remove student data
3. Search student
4. Exit
input your choice : 2
input student nim : 1300030996
Data succesfully deleted
```

Figure 9 Remove Student Data Menu

```
No. | Nim        | Name                | Score
=============================================
1 . | 1300030990 | Setiabudi           | 60
2 . | 1300030992 | Andi Setiawan       | 50
3 . | 1300030993 | Kuniardi            | 40
4 . | 1300030994 | John                | 70
5 . | 1300030998 | Karen Wijaya        | 80
=============================================
Average score : 60.00
=============================================

1. Input student data
2. Remove student data
3. Search student
4. Exit
input your choice :
```

Figure 10 List of Student and Average Score After Remove Student Data

e. If user choose **menu 3** (Search student), the program will :

- Ask user to input student nim
- If nim is not existed in the data, display message “data is not found”
- If nim is existed, display message how many program do the searches in AVL Tree and display student name and score like **picture 4**.

```
No. | Nim        | Name                | Score
=============================================
1 . | 1300030990 | Setiabudi           | 60
2 . | 1300030992 | Andi Setiawan       | 50
3 . | 1300030993 | Kuniardi            | 40
4 . | 1300030994 | John                | 70
5 . | 1300030998 | Karen Wijaya        | 80
=============================================
Average score : 60.00
=============================================

1. Input student data
2. Remove student data
3. Search student
4. Exit
input your choice : 3
input student nim : 1300030998
Data found after 2 searches
Name : Karen Wijaya
Score : 80
```

Figure 11 Search Student Menu

Notes :

1. **As a programmer, you are asked to create this program using AVL Tree Concept.**
2. **The value used to compare a node going left or right in this AVL Tree is student nim**
3. **Program will not exit, except user choose menu 4**
4. **For more details, please look at the exe program**

-- Good Luck --