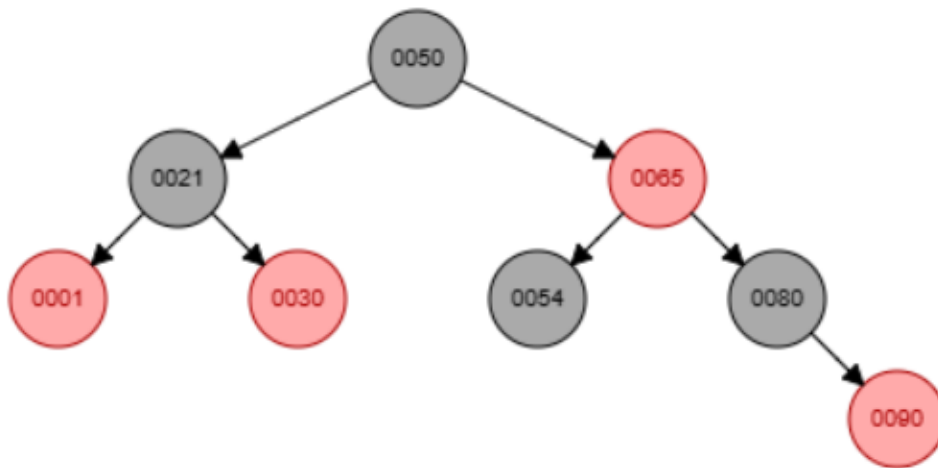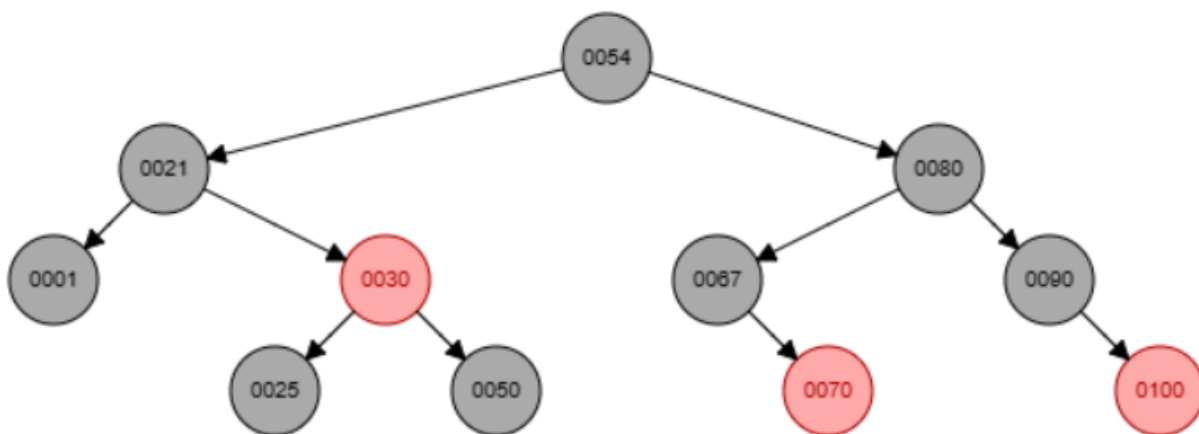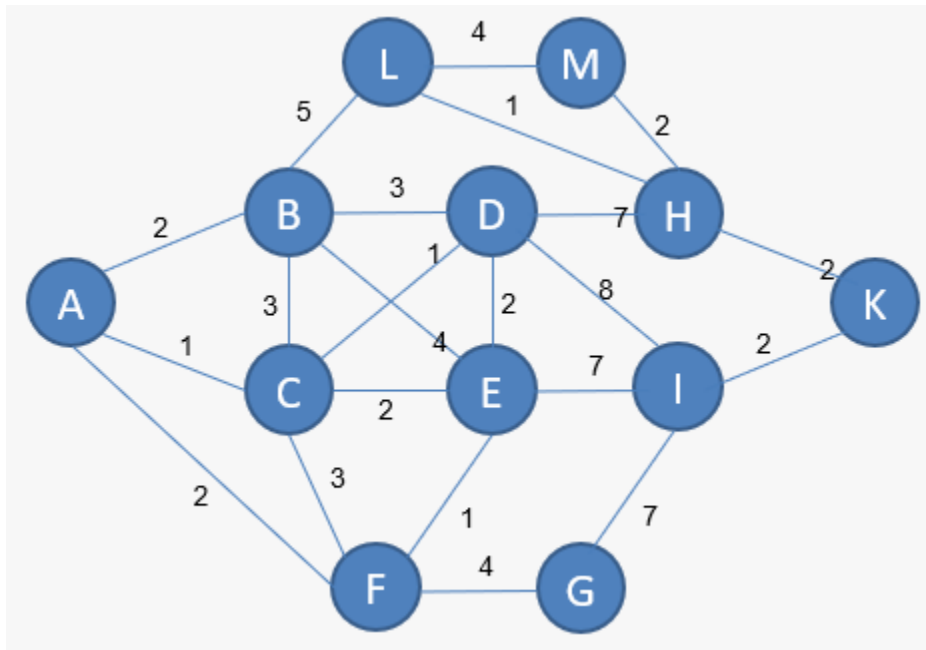1a. Given the red-black tree bellow, Perform insert: 67, 70, 29, 25, 100
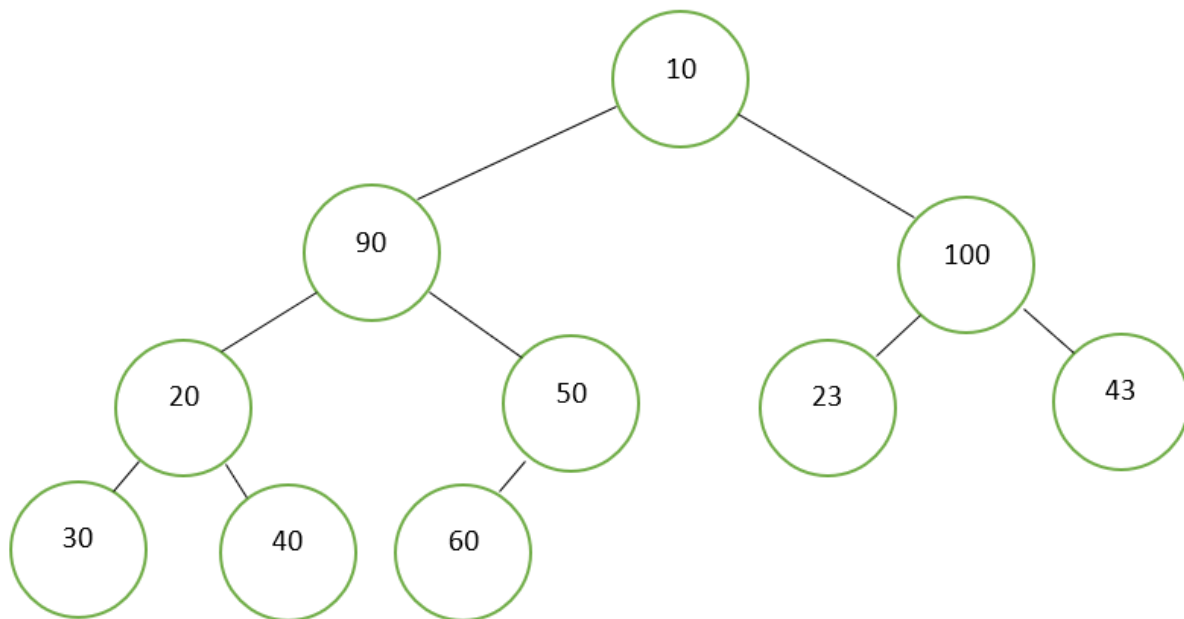

1b. Given the red-black tree bellow, perform delete: 25, 1, 70, 67, 21
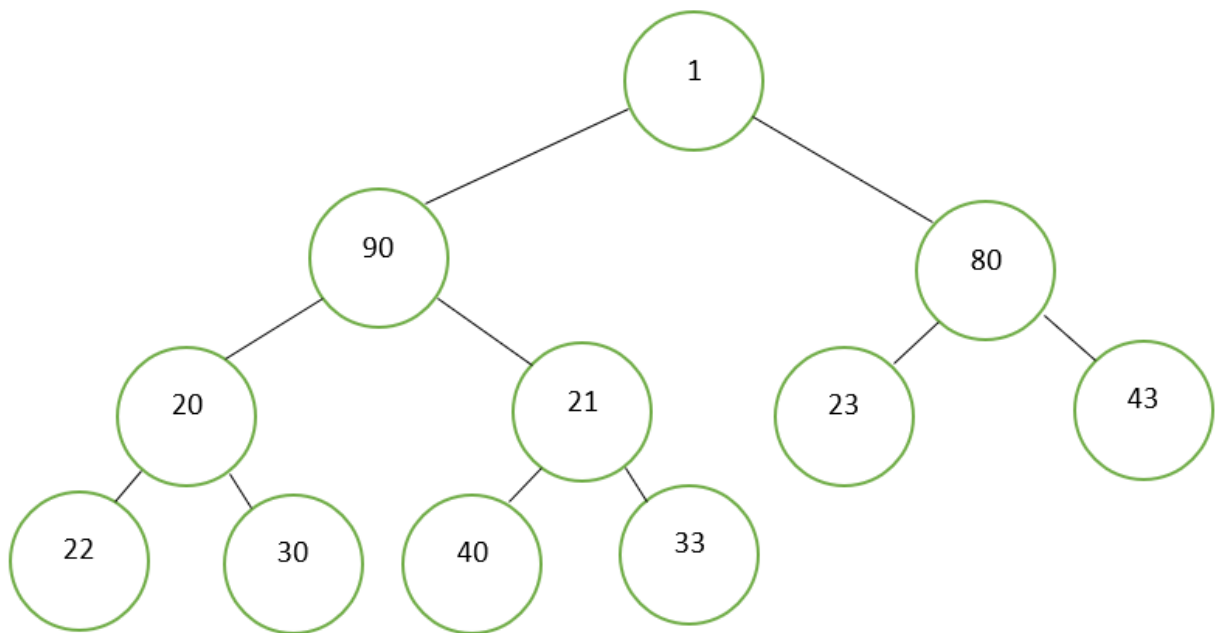
2. Given the graph bellow, find the shortest path From A to M

3a. Given the Min Max Heap, perform insert: 200, 5, 6, 101, 24.

3b. Given the Min Max Heap, perform delete min, min, max, max, min.

4. MyLibrary is a prototype web app that has been developed recently. This library can be accessed globally where people can buy books online. However, this website does not have any storage system yet. As their junior intern programmer, you are tasked to implement this storage system. You need to first create the system prototype using C Programming Language and **AVL tree concept**. The following is the requirement of the system.

- Book Data

  - Each data contains: **Title, Author, Release Year, Rating, Book ID**
  - Rating is an integer **between 1 and 5.**
  - Book ID is an integer **starting from 1**. Each new book will increase the ID by 1.

- Storage system

  - The main data structure for the system is **AVL Tree**. The **book ID** value will be used as the **key**.
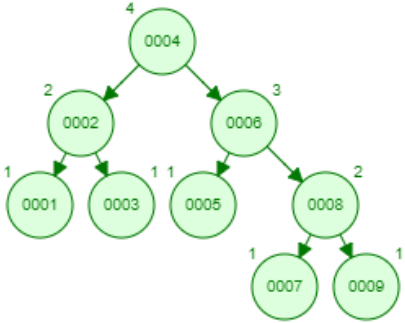 - You must validate that **no book has the same title and is case sensitive.**
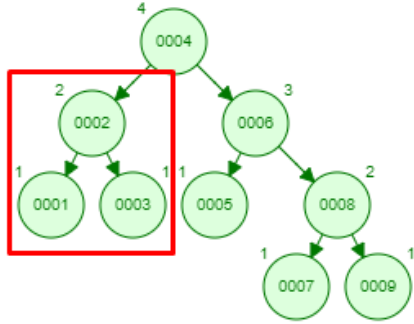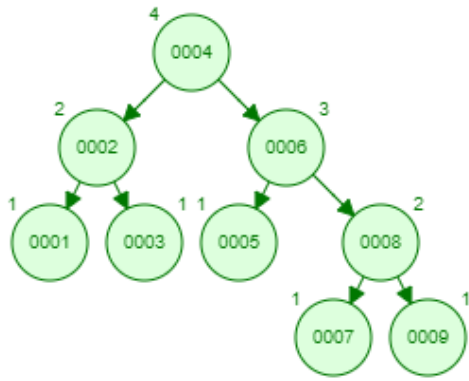
- The Application

  - You only need to create the prototype application; hence the application **does not have any user interface**. **All commands will be given via console**.
  - The program will insert dummy book data as follows (see book data):
    1. More Than Balloons, Gregor, 1997, 4, 1
    2. Dump Truck, Heimdall, 2000, 3, 2

3. Hello World, Travy, 1999, 4, 3
4. Secret Tetris, Tetron, 2010, 5, 4
5. Florian, Homer, 1997, 2, 5
6. Sea Gardener, Garen, 2005, 4, 6
7. Wild Dog, Hisna, 2006, 4, 7
8. Trump Game, Fiona, 2009, 2, 8
9. Class Act, Navi, 2001, 1, 9
10. Silly Bear, Garen, 2020, 5, 10

- First user needs to input an integer **N**, which is the number of commands they want to issue. After that **N** number of **commands** will follow. Some commands have **mandatory parameters**.
- There are **six different** command available as shown in the following table:

Command	Description
INSERT	- This command will be used to **entry new data** into the system. - First you need to put string **"INSERT"**, followed by **INT N**, followed by **N data** in the following order: **Title, Author, Release Year, Rating**. Each data is separated by **'#'** symbol. - You must make sure that the system **automatically assigns Book ID using the last Book ID + 1.** - You must make sure that **there are no duplicate titles in the system (case sensitive)**. If this happens, just skip the insertion of current data. - This command does not produce any output. Sample Input 1 INSERT 3 Garfield#Tom#2000#5 Village Well#Henry#2000#4 Main Trench#Edgar#2019#5 Sample Output (This command does not produce any output)
FIND	- This command will be used to **search data based on the given Book ID**. The input is string **"FIND"** followed by **the Book ID to search**. - Show **error message if the data does not exist**. - If the data exists, then **display the book data.** Sample Input 1 1 FIND 11 Sample Output 1 (if data exists) Book ID 11 found: ID: 11 Title: Garfield Author: Tom Year: 2000 Rating: 5 Sample Input 2 1 FIND 997 Sample Output 2 (if data does not exist)

	Book ID 997 not found.
DELETE	● This command will be used to delete score data from the system based on the **given Book ID**. ● The input is string "**DELETE**" followed by the **Book ID to delete**. ● Make sure to **remove the data** to save memories. ● Show **error message if the data does not exist**. ● This command does not produce any output. Sample Input 1 3 FIND 11 DELETE 11 FIND 11 Sample Output 1 (After find) Book ID 11 found: ID: 11 Title: Garfield Author: Tom Year: 2000 Rating: 5 (After find again) Book ID 11 not found.
SHOWALL	● This command will be used to show all data in ascending order based on **Book ID.** ● The input is string "**SHOWALL**". ● This command does not have any parameters. Sample Input 1 1 SHOWALL Sample Output 1 ID: 1 Title: More Than Balloons Author: Gregor Year: 1997 Rating: 4

	ID: 2 Title: Dump Truck Author: Heimdall Year: 2000 Rating: 3 . . . . ID: 13 Title: Main Trench Author: Edgar Year: 2019 Rating: 5
CHECKLEFTROOT	● This command is used for displaying the number of nodes on the left subtree of the root. ● The input is string "**CHECKLEFTROOT**". ● The sample input will use the AVL tree image below. Sample Input 1 1 CHECKLEFTROOT Sample Output 1 3 Explanation: As we can see from the image, the left subtree of the root is node 2, 1, & 3. Because there are 3 nodes, the output is 3. Please see the image below for more reference.

CHECKRIGHTROOT	- This command is used for displaying the number of nodes on the right subtree of the root. - The input is string "**CHECKRIGHTROOT**". - The sample input will use the AVL tree image below. Sample Input 1 1 CHECKRIGHTROOT Sample Output 1 5 Explanation: As we can see from the image, the right subtree of the root is node 6, 5, 8, 7, & 9. Because there are 5 nodes, the output is 5. Please see the image below for more reference.