

QUESTION 2

- a) In programming and computer science, stacks are frequently used in a variety of applications.
- i) Describe how stack is different than other data structures and give **TWO** examples of stack application in computer system. (5 marks)
- ii) RS Entertainment has launched a new online music player for Android users as illustrated in **Figure 1**. The application will automatically add any trending songs in Malaysia to the playlist so that it can be listened by users. The Stack concept was applied to the application's playlist.

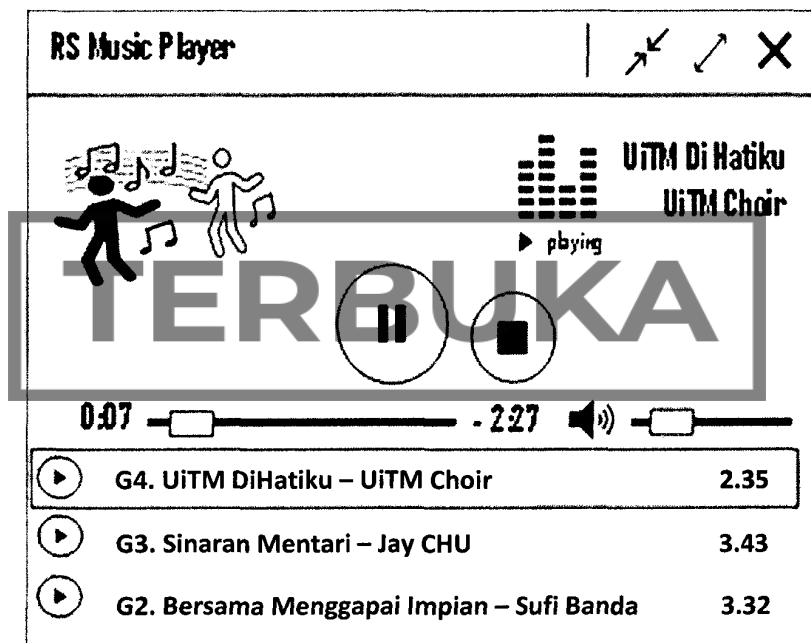


Figure 1

The following class `Song` was used for storing information about songs that contains data such as song's title, singer's name, and length of the song.

Assume that all data have been inserted into a Stack object named `playList`.

```

public class Song
{
    private String title;           //title of song
    private String singer;         //singer's name
    private double length;         //length of song in minutes

    /**
     * Definition of methods including a normal constructor,
     * accessors, and a toString() printer
     */
}

public class Stack
{
    public Stack() { ... }
    public void push(Song ...) { ... }
    public Song pop() { ... }
    public Song peek() { ... }
    public boolean isEmpty() { ... }
}

```

Write a program segment to compute and display the total length of all songs performed by the UiTM Choir. (Note: use a temporary stack to store the information to avoid data loss.)

(5 marks)

iii) Write a program segment to display information of all songs where the title starts with 'T' and length of the song is greater than 3 minutes. (Note: use a temporary stack to store the information to avoid data loss.)

(5 marks)

b) Given the following expression:

$$A - P + A / T + H * (E - T \$ I + C)$$

Convert the given expression into the following notation along with the steps.

i) Prefix

(5 marks)

ii) Postfix

(5 marks)

c) Given the following infix expression:

$$Z - (E \$ A * L + O) * U / S$$

- i) Convert the expression to postfix notation. Show all the steps.

(5 marks)

- ii) Evaluate the postfix notation using stack configuration table if the values of the operands are given as follows:

Z = 514, E = 2, A = 3, L = 2, O = 10, U = 2, S = 4

Show all the steps and the result.

(10 marks)

QUESTION 3

- a) Given an arithmetic expression as follows:

$$((f * g) + k / m - n) / ((a + b) * h)$$

- i) Draw the expression tree of the given arithmetic expression.

(5 marks)

- ii) Traverse the tree and write the **PREORDER** and **POSTORDER** traversal.

(5 marks)

- b) Given the definition of Flood, TreeNode and BSTFlood ADTs:

```
class Flood
{
    private String state;        //name of state
    private String district;    //name of district
    private int numOfPPS;       //number of PPS(relief centre)
    private int numOfFamily;    //number of family @ PPS
    private int numOfVictims;   //number of victims @ PPS

    /* Definition of the other methods including normal
       constructor, mutators, accessors, processors and
       printer*/
}

class TreeNode
{
    TreeNode left;    //left node
    Flood data;      //data item
    TreeNode right;  //right node

    /* Definition of the other methods*/
}
```