UE19CS353 : OBJECT ORIENTED ANALYSIS AND DESIGN

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PROBLEM STATEMENT :

Write a Java program to implement the following.

1. Define an abstract class TestQuestion that has a String data variable called question and a readQuestion abstract method.
2. Define three subclasses ShortAnswer, LongAnswer and MCQ. The subclasses should have the following data variables in addition to the question, ShortAnswer (numLines – by default set to 1), LongAnswer (numLines) and MCQ(numChoices, array of String for the choices)
3. The three subclasses define the readQuestion method as follows:
    1. ShortAnswer would read the question from standard input (keyboard) and also sets the numLines to 1 by default.
    2. LongAnswer would read the question and numLines from standard input (keyboard)
    3. MCQ would read the question, numChoices and choices from standard input (keyboard)
4. Write the toString method for each of the subclasses to display the details
5. The main method in TQManager class should contain an array of TestQuestions that references any type of subclasses. In the main function, the user chooses to create a question of a specific type and accordingly an instance is created and a reference is assigned in the array and the readQuestion method is invoked. Thereafter, display all the questions by implicitly invoking the toString method.

PROGRAM SCREENSHOTS:

```java

// PRIYA MOHATA
// PES2UG19CS301
// SECTION E

import java.util.Scanner;

abstract class TestQuestion{
    // Data members :
    String question;
    abstract void readQuestion();
}

class ShortAnswer extends TestQuestion{

    int numlines=1;

    // Method to read the question
    void readQuestion(){
        System.out.println("\nEnter the question please:");
        Scanner sc=new Scanner(System.in);
        question=sc.nextLine();
    }

    // Method to display the output
    @Override
    public String toString(){
        String str="The short answer question is:"+question+"\nThe number of lines are :"+numlines;
        return str;
    }
}
```

```java
class LongAnswer extends TestQuestion{
    int numlines;

    // Method to read the question
    void readQuestion(){
        System.out.println("\nEnter the question please:");
        Scanner sc=new Scanner(System.in);
        question=sc.nextLine();
        System.out.println("\nEnter the number of lines:");
        numlines=sc.nextInt();
    }

    // Method to display the output
    @Override
    public String toString(){
        String str="The long answer question is:"+question+"\nThe number of lines are :"+numlines;
        return str;
    }
}
```

```java
class MCQ extends TestQuestion{
    int numchoices;
    String[] choices;

    // Method to read the question
    void readQuestion(){
        System.out.println("\nEnter the question please:");
        Scanner sc=new Scanner(System.in);
        question=sc.nextLine();
        System.out.println("\nEnter the number of choices please:");
        numchoices=sc.nextInt();
        choices=new String[numchoices+1];
        System.out.println("\nEnter the choices:");
        sc.nextLine();
        for(int i=0;i<numchoices;i++)
        {
            choices[i] = sc.nextLine();
        }
    }

    // Method to display the output
    @Override
    public String toString(){
        String str="The MCQ question is:"+question+"\nThe number of choices are :"+numchoices+"\n";
        str=str+"The choices are as follows:\n";
        for(int i=0;i<numchoices;i++){
            str=str+"Choice "+(i+1)+" "+choices[i]+"\n";
        }
        return str;
    }

}
```

```java
public class TQManager {
    Run | Debug
    public static void main(String[] args)
    {
        int noq,choice;
        Scanner scanner = new Scanner(System.in);
        System.out.println("\nEnter the number of questions: ");
        noq = scanner.nextInt();
        scanner.nextLine();
        TestQuestion[] pointer=new TestQuestion[noq];

        for(int j=0;j<noq;j++)
        {
                System.out.println("\nPress 1 for SHORT ANSWER");
                System.out.println("Press 2 for LONG ANSWER");
                System.out.println("Press 3 for MCQ");
                System.out.println("Press any other number to exit\n");
                System.out.println("Enter your choice: ");

                choice = scanner.nextInt();
                scanner.nextLine();
                switch(choice)
                {
                    case 1:
                        ShortAnswer sa=new ShortAnswer();
                        sa.readQuestion();
                        pointer[j]=sa;
                        break;

                    case 2:
                        LongAnswer la=new LongAnswer();
                        la.readQuestion();
                        pointer[j]=la;
                        break;
```

```
120                     case 3:
121                         MCQ mcq=new MCQ();
122                         mcq.readQuestion();
123                         pointer[j]=mcq;
124                         break;
125 
126                     default:
127                         System.exit(0);
128                 }
129         }
130         for(int i= 0;i<noq;i++)
131         {
132             System.out.println(pointer[i]+"\n\n");
133         }
134         scanner.close();
135     }
136 }
```

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OUTPUT SCREENSHOTS :

```
Make your choice:
apple@Apples-MacBook-Air Week3 % javac TQManager.java
apple@Apples-MacBook-Air Week3 % java TQManager

Enter the number of questions:
3

Press 1 for SHORT ANSWER
Press 2 for LONG ANSWER
Press 3 for MCQ
Press any other number to exit

Enter your choice:
1

Enter the question please:
What is the formula of methyl alcohol?

Press 1 for SHORT ANSWER
Press 2 for LONG ANSWER
Press 3 for MCQ
Press any other number to exit

Enter your choice:
2

Enter the question please:
What were the reasons for World War II ?

Enter the number of lines:
5

Press 1 for SHORT ANSWER
Press 2 for LONG ANSWER
Press 3 for MCQ
Press any other number to exit

Enter your choice:
3

Enter the question please:
Which among these states is the largest producer of coffee in India ?

Enter the number of choices please:
4

Enter the choices:
Karnataka
Tamil Nadu
Kerala
Andra Pradesh
```

```
The short answer question is:What is the formula of methyl alcohol?
The number of lines are :1


The long answer question is:What were the reasons for World War II ?
The number of lines are :5


The MCQ question is:Which among these states is the largest producer of coffee in India ?
The number of choices are :4
The choices are as follows:
Choice 1 Karnataka
Choice 2 Tamil Nadu
Choice 3 Kerala
Choice 4 Andra Pradesh



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```

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ADDITIONAL QUESTION :

Write an integer list class. It should create a list of a fixed size and have a method add to add an element to the end of a list. If the list is already full, a message will be printed.

Now write a class SortedIntList that extends IntList. SortedIntList should be just like IntList except that its elements should always be in sorted order from smallest to largest. This means that when an element is inserted into a SortedIntList it should be put into its sorted place, not just at the end of the array. Hence, you need to override the add method. (Optionally, you can use recursion to locate the position of the element to be inserted.)

PROGRAM:

```java
// PRIYA MOHATA // PES2UG19CS301  // SECTION E
import java.util.Scanner;

class IntegerList{
    int list[];
    int numElements=0;

    public IntegerList(int size) {
        list = new int[size];
    }
    // Function to add in a value
    void add(int value){
        if(numElements==list.length){
            System.out.println("Sorry its not possible to add elements!\n");
        }
        else
        {
            list[numElements]=value;
            numElements++;
        }

    }

    @Override
    public String toString(){
        String returnString = "";
        for (int i = 0; i < numElements; i++) {
            returnString += i + ": " + list[i] + "\n";
        }
        return returnString;
    }
}

```

```java
class SortedList extends IntegerList{

    public SortedList(int size){
        super(size);
    }
    void add(int value){
        if(numElements==list.length){
            System.out.println("Sorry its not possible to add elements!\n");
        }
        else
        {
            list[numElements]=value;
            numElements++;
            for (int i = 0; i < list.length; i++) {
                if (list[i] > value) {
                    for (int j = list.length - 1; j > i; j--) {
                        list[j] = list[j - 1];
                    }
                    list[i] = value;
                    break;
                }
            }
        }
    }
}
```

```java
class Main{
    Run | Debug
    public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        // Fixed size array of 10 elements
        IntegerList myList = new IntegerList(10);
        int count = 0;
        int num=0;
        while (count < 10) {
            System.out.println("Please enter the element of the array, enter 0 to quit");
            num = scan.nextInt();
            if (num != 0) {
                myList.add(num);
                count++;
            } else {
                break;
            }
        }
        System.out.println(myList);


        SortedList mylist1=new SortedList(10);
        int count1 = 0;
        int num1;
        while (count1 < 10) {
            System.out.println("Please enter the element of the array, enter 0 to quit");
            num1 = scan.nextInt();
            if (num1 != 0) {
                mylist1.add(num1);
                count1++;
            } else {
                break;
            }
        }
        System.out.println(mylist1);
        scan.close();
    }
}
```

OUTPUT:

```
apple@Apples-MacBook-Air Week3 % javac IntegerList.java
apple@Apples-MacBook-Air Week3 % java Main
Please enter the element of the array, enter 0 to quit
10
Please enter the element of the array, enter 0 to quit
20
Please enter the element of the array, enter 0 to quit
30
Please enter the element of the array, enter 0 to quit
40
Please enter the element of the array, enter 0 to quit
50
Please enter the element of the array, enter 0 to quit
60
Please enter the element of the array, enter 0 to quit
70
Please enter the element of the array, enter 0 to quit
80
Please enter the element of the array, enter 0 to quit
90
Please enter the element of the array, enter 0 to quit
100
0: 10
1: 20
2: 30
3: 40
4: 50
5: 60
6: 70
7: 80
8: 90
9: 100
```

```
Please enter the element of the array, enter 0 to quit
10
Please enter the element of the array, enter 0 to quit
9
Please enter the element of the array, enter 0 to quit
8
Please enter the element of the array, enter 0 to quit
7
Please enter the element of the array, enter 0 to quit
6
Please enter the element of the array, enter 0 to quit
5
Please enter the element of the array, enter 0 to quit
4
Please enter the element of the array, enter 0 to quit
3
Please enter the element of the array, enter 0 to quit
2
Please enter the element of the array, enter 0 to quit
1
0: 1
1: 2
2: 3
3: 4
4: 5
5: 6
6: 7
7: 8
8: 9
9: 10

apple@Apples-MacBook-Air Week3 %
```


---------- THANK YOU ----------