Homework 5

Object Oriented Programming and File IO

The following problem set is worth 100 points. Please submit a zip file containing all source code I need to run your assignments using **QtSPIM**. Code will be graded on elegance and correctness.

Problem 1: Set Program (40pts)

Create a class **IntegerSet** which can hold integers in the range from 0 to 100. The set is represented internally as an array of ones and zeroes. Array element **a[i]** is 1 if the integer *i* is in the set. Array element **a[i]** is 0 if the integer *i* is not in the set. The default constructor initializes the set to be the "empty set", a set whose array representation consists of all zeroes.

Include the following member set functions on your class:

Method Name	Method Description
unionOf	A method that creates a third set which is the union of two set objects (e.g. an element in the third set's array is 1 if it is 1 in either of the arrays of the two sets).
intersectionOf	A method that creates a third set which is the intersection of two set objects (e.g. an element in the third set's array is 1 if it is 1 in the array of each set argument).
insertElement	Inserts a new integer *k* into a set
deleteElement	Removes an integer *k* from a set
printSet	A method that prints a set with each element separated by spaces
equals	Used to compare two set objects for equality

In your main method create a number of sets and test each of the methods above. Save your code in **set.asm**.

Problem 2: Account Problem (30pts)

Create a class named **SavingsAccount**. This class contains instance data such as the following:

Data Member	Description
annualInterestRate	Interest rate set for the account
savingsBalance	The amount the account currently has on deposit

accountNumber	Unique identifying number for the account (integer)

Include the methods on your class

Method Name	**Description**
calculateMonthlyInterest	Multiplies the balance by the interest rate and divides by 12 (this is then added to the balance)
setInterestRate	Changes the value of the annual interest rate
printBalance	Prints the balance on the account

In your main method, create two account objects, with balances of $2000.00 and $3000.00 respectively. Set the annual interest rate to 3% on each account. Then calculate the monthly interest rate and print the new balances for each account. Then set the interest rate to 4% on each account. Print the new monthly balances on each account.

Save your code in **savingsAccount.asm**.

Problem 3: File Problem (30pts)

Using the account code you created above, consider two text files: **balances.txt** and **transactions.txt**. The balance text file looks like the following:

```
100
348.17
300
27.19
500
0.00
700
1000.00
```

The transaction text file looks like the following:

```
100
27.14
300
62.11
400
100.56
```

```
900
82.17
```

In a real-world environment, this file would be some delimited file (separated by commas, pipes, tabs, etc.) Since parsing a line is difficult to do with MIPS, the next best option is to read a text file line by line. A record in either file is represented as a pair. The first line in the pair is the account number and the second line in the file is some amount. In the balance file, the amount would be the initial value of the account. In the transaction file the amount would be the amount that is being deposited in the account.

For instance, if you see these two lines in the transaction file:

```
200
34.17
300
-14.40
```

Account 200 has $34.17 deposited in their account. Account 300 has $14.40 withdrawn from their account.

In your main method, use these two files in your main method as follows:

1. Create accounts for each record in **balanaces.txt** with initial values given
2. Set each annual interest rate to each account as 3%
3. Read each record in **transactions.txt** and debit or credit the account accordingly
4. Invoke the monthly interest method on each account
5. Print the balance of each account after the interest is applied

Save your solution in a file named **savingsAccountFile.asm**.

Submission Requirements

Please submit a zip file containing all source code I need for testing before the closing of the Canvas drop box.