**COSC 3346 Operating Systems   
  
Project #4: Implementation of Banker's Algorithm**

**OBJECTIVE**

The purpose of this programming project is to explore resource allocation algorithms.  This can be achieved by implementing the banker's algorithm as described in our textbook and discussed in class.

**This project is worth 100 points.**

**PROJECT SPECIFICATIONS**

Review the banker's algorithm discussed in class and on pages 330-336 from the book.  **Your program must be named "banker"** **and will read the allocation, max, available, and request vectors from a file.** **The name of the file will be passed to your program as a command line argument.**  The input file format is the following:

* number of processes: n
* number of resource types: m
* An n x m allocation matrix
* An n x m max matrix
* A 1 x m available vector
* Ai : 1 x m request vector

Your program will output the following in a standardized format.

1. Echo the number of processes.
2. Echo the number of resource types.
3. Echo the allocation matrix.  Label the processes and resource types (see sample output).
4. Echo the max matrix.  Label the processes and resource types (see sample output).
5. Compute and print the need matrix.  Label the processes and resource types (see sample output).
6. Echo the available vector.  Label the resource types.
7. Compute if the system is in a safe state.
8. Echo the request vector.  Label the process making the request and resource types (see sample output).
9. Compute if the request can be granted.
10. Compute the new available vector (see sample output).

[Here is a sample input file](file:///C:\Users\dkar\Desktop\fall2020\3346\Project5\s1.txt).

|  |
| --- |
| 5  4  0 0 1 2  1 0 0 0  1 3 5 4  0 6 3 2  0 0 1 4  0 0 1 2  1 7 5 0  2 3 5 6  0 6 5 2  0 6 5 6  1 5 2 0  1:0 4 2 0 |

Here is how the program should be run.

% banker s1.txt

[Here is the sample output.](file:///C:\Users\dkar\Desktop\fall2020\3346\Project5\s1_soln.txt)

|  |
| --- |
| There are 5 processes in the system.  There are 4 resource types.  The Allocation Matrix is...  A B C D  0: 0 0 1 2  1: 1 0 0 0  2: 1 3 5 4  3: 0 6 3 2  4: 0 0 1 4  The Max Matrix is...  A B C D  0: 0 0 1 2  1: 1 7 5 0  2: 2 3 5 6  3: 0 6 5 2  4: 0 6 5 6  The Need Matrix is...  A B C D  0: 0 0 0 0  1: 0 7 5 0  2: 1 0 0 2  3: 0 0 2 0  4: 0 6 4 2  The Available Vector is...  A B C D  1 5 2 0  THE SYSTEM IS IN A SAFE STATE!  The Request Vector is...  A B C D  1:0 4 2 0  THE REQUEST CAN BE GRANTED!  The Available Vector is...  A B C D  1 1 0 0 |

Sample input is provided however you should test your program with different number of processes and resource types (i.e. different datasets).

**ASSESSMENT AND GRADING**

This is an individual assignment.  Your program may be written in C or C++.  Comment and document all code submitted!  Use riddler..edu for your program development and testing.  You may do development work on your personal computer but final submissions must compile on riddler..edu without errors or warnings and execute without core dumping.  Your project must follow the documentation standards explained earlier.  Use good programming practices by implementing procedures and functions where necessary.  You may use the STL in your solution.

**PROJECT SUBMISSION**

1. Your work should be submitted as a zip file (Ex: Proj4.zip) on Blackboard. Include the source code and input data files. This file should restore the files in a directory, named after your username, an underscore, and the project number (\_Proj4) containing the appropriate files and/or answers to the question(s), if any.

2. Unless otherwise noted in the assignment notice, your answer must compile/run/work on riddler..edu.