Assignment 4

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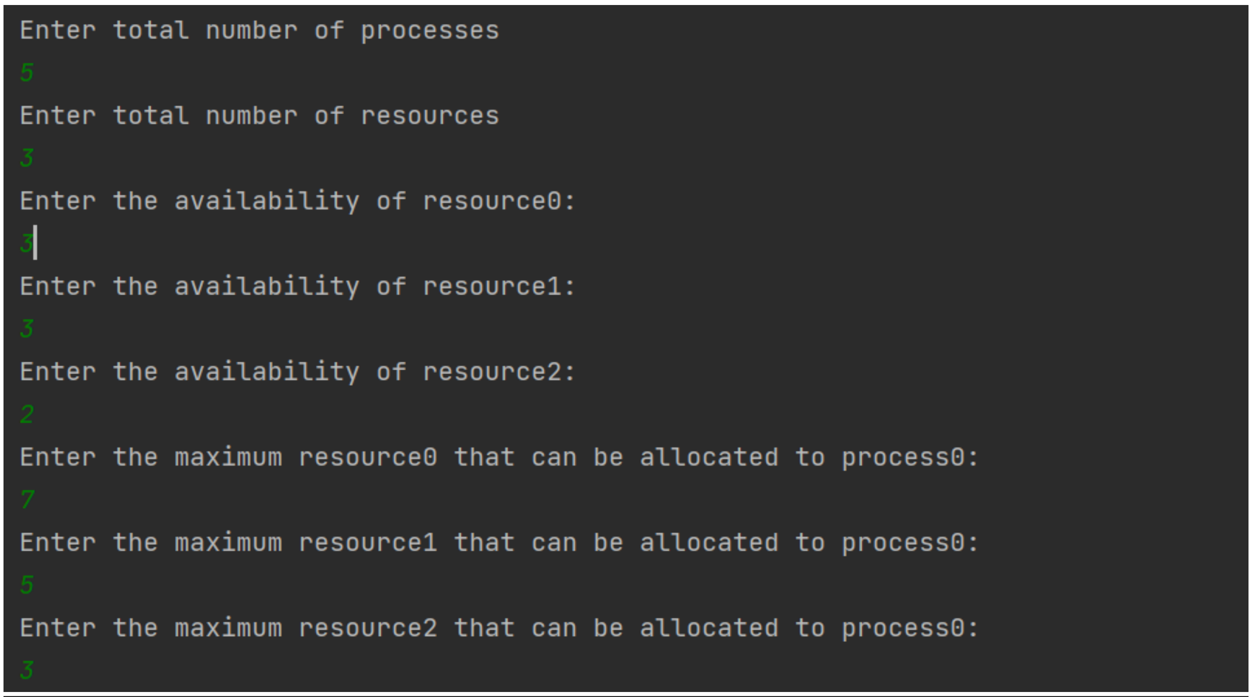
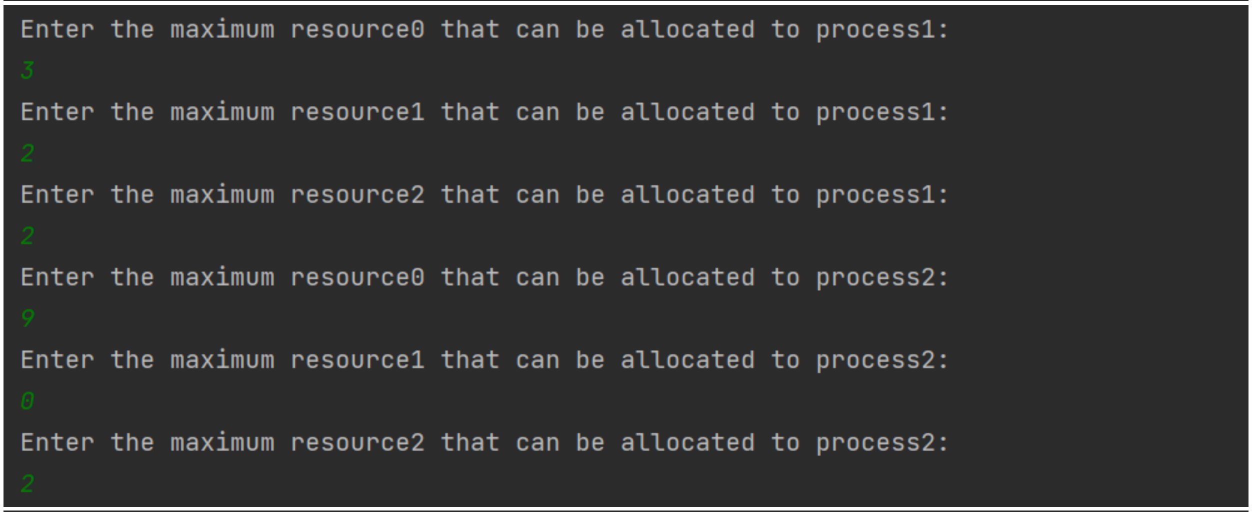
CS-A Batch 3

Banker’s Algorithm

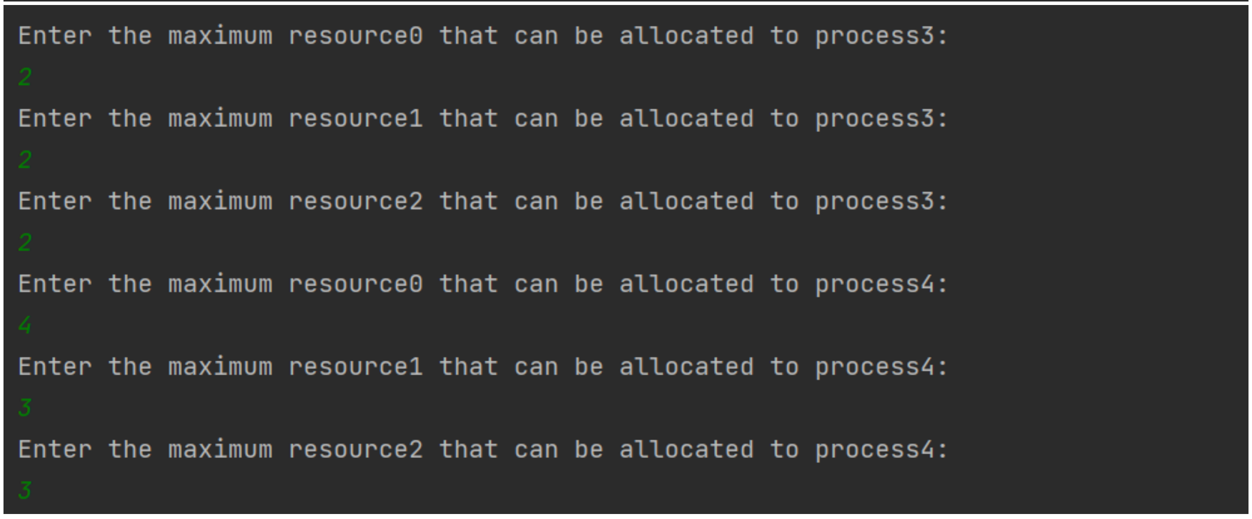
```
import java.util.*;
import java.io.*;
import java.util.Scanner;


class BankersAlgoExample
{

    static void findNeedValue(int needArray[][], int maxArray[][], int
allocationArray[][], int totalProcess, int totalResources)
    {

        for (int i = 0 ; i < totalProcess ; i++){     // for each process
            for (int j = 0 ; j < totalResources ; j++){   //for each resource
                needArray[i][j] = maxArray[i][j] - allocationArray[i][j];
            }
        }
    }


    static boolean checkSafeSystem(int processes[], int availableArray[], int
maxArray[][], int allocationArray[][], int totalProcess, int totalResources)
    {
        int [][]needArray = new int[totalProcess][totalResources];

        findNeedValue(needArray, maxArray, allocationArray, totalProcess,
totalResources);

        boolean []finishProcesses = new boolean[totalProcess];

        int []safeSequenceArray = new int[totalProcess];

        int []workArray = new int[totalResources];

        for (int i = 0; i < totalResources ; i++)
            workArray[i] = availableArray[i];

        int counter = 0;

        while (counter < totalProcess)
        {
            boolean foundSafeSystem = false;
            for (int m = 0; m < totalProcess; m++)
            {
                if (finishProcesses[m] == false)
                {
                    int j;
                    for (j = 0; j < totalResources; j++)
                        if (needArray[m][j] > workArray[j])
                            break;

                    if (j == totalResources)
                    {
                        for (int k = 0 ; k < totalResources ; k++)
                            workArray[k] += allocationArray[m][k];

                        safeSequenceArray[counter++] = m;

                        finishProcesses[m] = true;

                        foundSafeSystem = true;
                    }
                }
            }

            if (foundSafeSystem == false)
            {
                System.out.print("The system is not in the safe state because
lack of resources");
                return false;
            }
        }

        System.out.print("The system is in safe sequence and the sequence is
as follows: ");
        for (int i = 0; i < totalProcess ; i++)
            System.out.print("P"+safeSequenceArray[i] + " ");

        return true;
    }

    public static void main(String[] args)
    {
        int numberOfProcesses, numberOfResources;

        Scanner sc = new Scanner(System.in);

        System.out.println("Enter total number of processes");
        numberOfProcesses = sc.nextInt();

        System.out.println("Enter total number of resources");
        numberOfResources = sc.nextInt();

        int processes[] = new int[numberOfProcesses];
        for(int i = 0; i < numberOfProcesses; i++){
            processes[i] = i;
        }

        int availableArray[] = new int[numberOfResources];
        for( int i = 0; i < numberOfResources; i++){
            System.out.println("Enter the availability of resource"+ i +":
");
            availableArray[i] = sc.nextInt();
        }
        int maxArray[][] = new int[numberOfProcesses][numberOfResources];
        for( int i = 0; i < numberOfProcesses; i++){
            for( int j = 0; j < numberOfResources; j++){
                System.out.println("Enter the maximum resource"+ j +" that
can be allocated to process"+ i +": ");
                maxArray[i][j] = sc.nextInt();
            }
        }

        int allocationArray[][] = new
int[numberOfProcesses][numberOfResources];
        for( int i = 0; i < numberOfProcesses; i++){
            for( int j = 0; j < numberOfResources; j++){
                System.out.println("How many instances of resource"+ j +" are
allocated to process"+ i +"? ");
                allocationArray[i][j] = sc.nextInt();
            }
        }

        checkSafeSystem(processes, availableArray, maxArray, allocationArray,
numberOfProcesses, numberOfResources);
    }
}
```



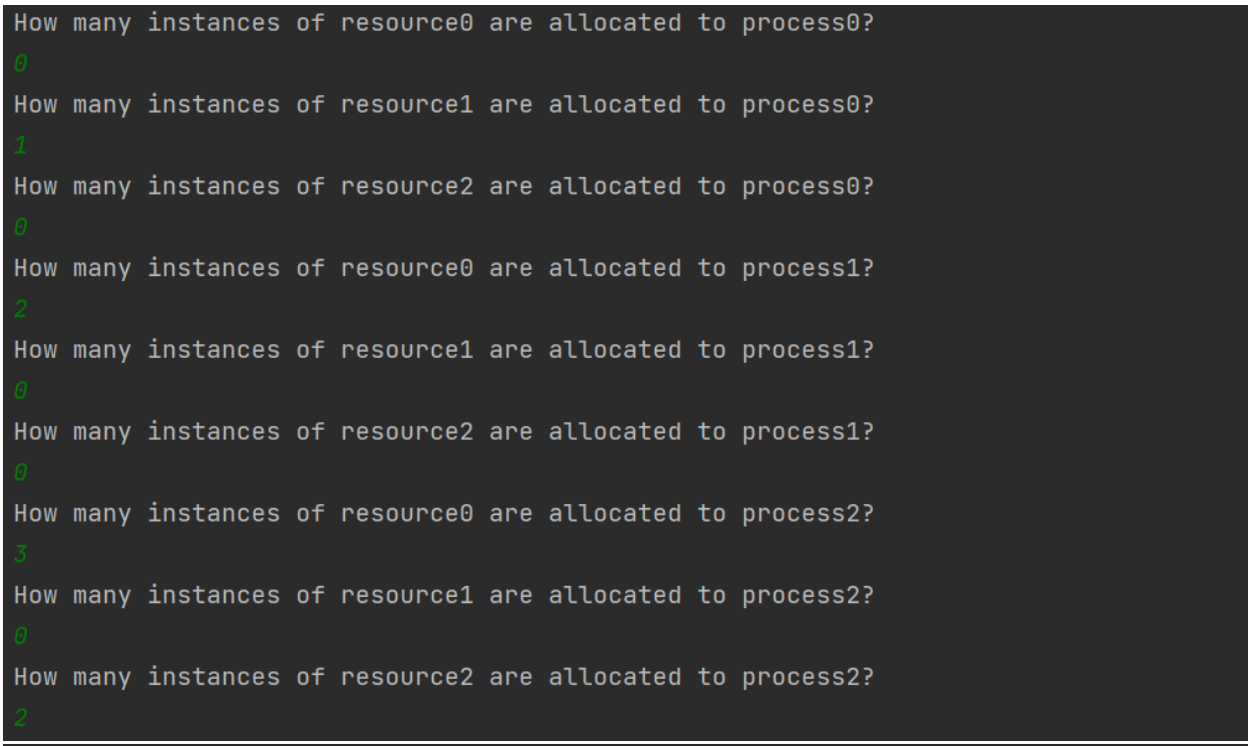
```
Enter total number of processes
5
Enter total number of resources
3
Enter the availability of resource0:
3
Enter the availability of resource1:
3
Enter the availability of resource2:
2
Enter the maximum resource0 that can be allocated to process0:
7
Enter the maximum resource1 that can be allocated to process0:
5
Enter the maximum resource2 that can be allocated to process0:
3
```



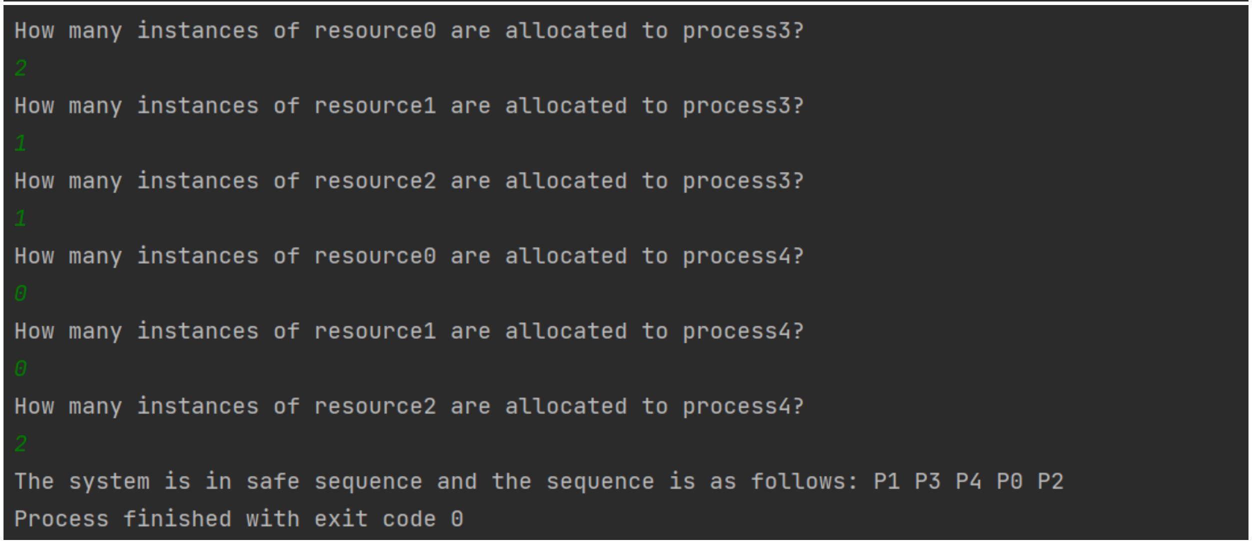
```
Enter the maximum resource0 that can be allocated to process1:
3
Enter the maximum resource1 that can be allocated to process1:
2
Enter the maximum resource2 that can be allocated to process1:
2
Enter the maximum resource0 that can be allocated to process2:
9
Enter the maximum resource1 that can be allocated to process2:
0
Enter the maximum resource2 that can be allocated to process2:
2
```



```
Enter the maximum resource0 that can be allocated to process3:
2
Enter the maximum resource1 that can be allocated to process3:
2
Enter the maximum resource2 that can be allocated to process3:
2
Enter the maximum resource0 that can be allocated to process4:
4
Enter the maximum resource1 that can be allocated to process4:
3
Enter the maximum resource2 that can be allocated to process4:
3
```



```
How many instances of resource0 are allocated to process0?
0
How many instances of resource1 are allocated to process0?
1
How many instances of resource2 are allocated to process0?
0
How many instances of resource0 are allocated to process1?
2
How many instances of resource1 are allocated to process1?
0
How many instances of resource2 are allocated to process1?
0
How many instances of resource0 are allocated to process2?
3
How many instances of resource1 are allocated to process2?
0
How many instances of resource2 are allocated to process2?
2
```



```
How many instances of resource0 are allocated to process3?
2
How many instances of resource1 are allocated to process3?
1
How many instances of resource2 are allocated to process3?
1
How many instances of resource0 are allocated to process4?
0
How many instances of resource1 are allocated to process4?
0
How many instances of resource2 are allocated to process4?
2
The system is in safe sequence and the sequence is as follows: P1 P3 P4 P0 P2
Process finished with exit code 0
```