# Worksheet 05 -Banker's Algorithm

1. Using Banker's algorithm, answer the following questions:-
   i) What is the available vector?
   ii) What are the contents of need matrix?
   iii) Find if the system is in safe state? If it is, find the safe sequence.

   If there are four process and 4 resources A,B,C and D each with instances 3,14,12 and 12.

| Process | Max | Allocation | Available T=alloc | Need =max-alloc |
|---|---|---|---|---|
| | A, B, C, D | A, B, C, D | | 0000 |
| P0 | 0 0 1 2 | 0 0 1 2 | 0012 | 0000 |
| P1 | 1 7 5 0 | 1 0 0 0 | 2658 | 0750 |
| P2 | 2 3 5 6 | 1 3 5 4 | 1012 | 1002 |
| P3 | 0 6 5 2 | 0 6 3 2 | 1644 | 0020 |
| P4 | 0 6 5 6 | 0 0 1 4 | 1658 | 0642 |

if need ≤ avail.
avail += alloc.

2. Using Banker's algorithm, answer the following questions:-
   i) How many resources of type A, B, C, D are there?
   ii) What are the contents of need matrix?
   iii) Find if the system is in safe state? If it is, find the safe sequence.

| Process | Max | Allocation | Available | Need max-alloc |
|---|---|---|---|---|
| | A, B, C, D | A, B, C, D | | |
| P0 | 6 0 1 2 | 4 0 0 1 | 3 2 1 1 | 2011 |
| P1 | 2 7 5 0 | 1 1 0 0 | 7212 | 1650 |
| P2 | 2 3 5 6 | 1 2 5 4 | 8466 | 1102 |
| P3 | 1 6 5 3 | 0 6 3 3 | 8(10)99 | 1020 |
| P4 | 1 6 5 6 | 0 2 1 2 | 8(12)(10)(11) | 1444 |

if need ≤ avail.
avail. += alloc

P0, P2, P3, P4, P1

3. Assume that there are 5 processes, P0 through P4, and 4 types of resources. At time(t0) we have the following system state:
Check if the system is in a safe state, and see if we can grant the following requests be, why or why not?

   a. P1 requests (2,1,1,0)
   b. P1 requests (0,2,1,0)

| Process | Max | Allocation | Available + = alloc | Need max-alloc |
|---|---|---|---|---|
| P0 | A, B, C, D | A, B, C, D | | |
| P1 | 0 2 1 0 | 0 1 1 0 | 1 5 2 0 | 0100 |
| P2 | 1 6 5 2 | 1 2 3 1 | 1630 | 0421 |
| P3 | 2 3 6 6 | 1 3 6 5 | 2861 | 1001 |
| P4 | 0 6 5 2 | 0 6 3 2 | 3(11)(12)6 | 0020 |
| P0 | 0 6 5 6 | 0 0 1 4 | 3(17)(15)8 | 0642 |

if need ≤ avail
avail. += alloc.

$P_1, P_2, P_3, P_4$

a.) Impossible since (2110) ≯ (1520)

b.) Possible since (0210) < (1520)