LAB 6

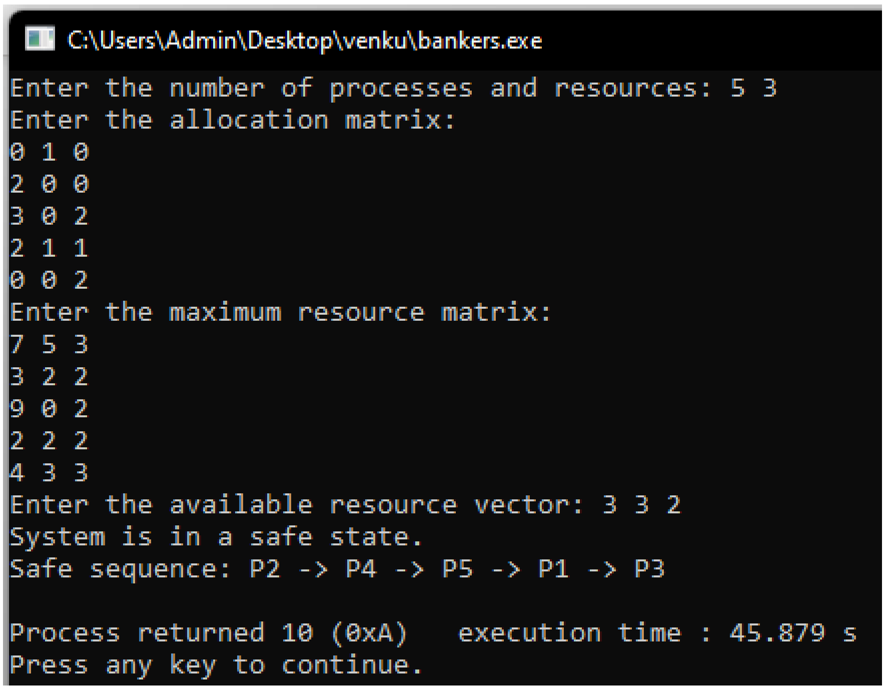
Q. Simulate bankers algorithm for deadlock avoidance.

CODE:

```
#include <stdio.h>
#include <stdbool.h>

void main() {
   int alloc[10][10], max[10][10], avail[10], work[10];
   int need[10][10];
   char finish[10] = {0};
   int n, m;
   char safe_sequence[10][3];
   int count = 0;

   printf("Enter the number of processes and resources: ");
   scanf("%d%d", &n, &m);

   printf("Enter the allocation matrix:\n");
   for (int i = 0; i < n; i++)
      for (int j = 0; j < m; j++)
         scanf("%d", &alloc[i][j]);

   printf("Enter the maximum resource matrix:\n");
   for (int i = 0; i < n; i++)
      for (int j = 0; j < m; j++)
         scanf("%d", &max[i][j]);

   printf("Enter the available resource vector: ");
   for (int i = 0; i < m; i++) {
      scanf("%d", &avail[i]);
```

```
    work[i] = avail[i];
}

// Calculate the need matrix (need = max - alloc)
for (int i = 0; i < n; i++)
    for (int j = 0; j < m; j++)
        need[i][j] = max[i][j] - alloc[i][j];

// Safety Algorithm
bool found = false;
int index = 0;

while (count < n) {
    found = false;
    for (int i = 0; i < n; i++) {
        if (!finish[i]) {
            bool can_execute = true;
            for (int j = 0; j < m; j++) {
                if (need[i][j] > work[j]) {
                    can_execute = false;
                    break;
                }
            }
            if (can_execute) {
                for (int j = 0; j < m; j++)
                    work[j] += alloc[i][j];
                finish[i] = 1;
                sprintf(safe_sequence[index++], "P%d", i + 1);
                count++;
                found = true;
            }
            }
        }
        if (!found)
            break;
    }

    if (count == n) {
        printf("System is in a safe state.\nSafe sequence: ");
        for (int i = 0; i < n; i++) {
            printf("%s", safe_sequence[i]);
            if (i < n - 1)
                printf(" -> ");
        }
        printf("\n");
    } else {
        printf("System is not in a safe state.\n");
    }
}
```

Output:



```
Enter the number of processes and resources: 5 3
Enter the allocation matrix:
0 1 0
2 0 0
3 0 2
2 1 1
0 0 2
Enter the maximum resource matrix:
7 5 3
3 2 2
9 0 2
2 2 2
4 3 3
Enter the available resource vector: 3 3 2
System is in a safe state.
Safe sequence: P2 -> P4 -> P5 -> P1 -> P3

Process returned 10 (0xA)   execution time : 45.879 s
Press any key to continue.
```