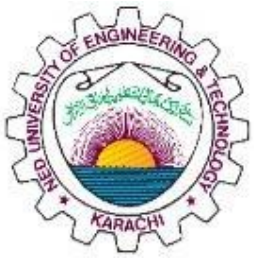

NED UNIVERSITY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE & IT

Specialization in Data Science

CT-353
OPERATING SYSTEMS

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LAB : 08

```c
#include <stdio.h>
#include <conio.h>

int max[100][100];
int alloc[100][100];
int need[100][100];
int avail[100];
int n, r;

void input();
void show();
void cal();

int main() {
    printf("********** Deadlock Detection Algorithm ***********\n");
    input();
    show();
    cal();
    getch();
    return 0;
}

void input() {
    int i, j;
    printf("Enter the number of Processes:\t");
    scanf("%d", &n);
    printf("Enter the number of Resource Instances:\t");
    scanf("%d", &r);

    printf("Enter the Max Matrix:\n");
    for (i = 0; i < n; i++) {
        for (j = 0; j < r; j++) {
            scanf("%d", &max[i][j]);
        }
    }

    printf("Enter the Allocation Matrix:\n");
    for (i = 0; i < n; i++) {
        for (j = 0; j < r; j++) {
            scanf("%d", &alloc[i][j]);
        }
    }

    printf("Enter the Available Resources:\n");
```

```
49
50  void show() {
51      int i, j;
52      printf("\nProcess\tAllocation\tMax\t\tAvailable\n");
53      for (i = 0; i < n; i++) {
54          printf("P%d\t", i + 1);
55          for (j = 0; j < r; j++) {
56              printf("%d ", alloc[i][j]);
57          }
58
59          printf("\t");
60          for (j = 0; j < r; j++) {
61              printf("%d ", max[i][j]);
62          }
63
64          printf("\t");
65          if (i == 0) {
66              for (j = 0; j < r; j++) {
67                  printf("%d ", avail[j]);
68              }
69          }
70          printf("\n");
71      }
72  }
73
74  void cal() {
75      int finish[100], dead[100];
76      int i, j, k, c, c1 = 0, flag = 1;
77
78      // Initialize finish array
79      for (i = 0; i < n; i++) {
80          finish[i] = 0;
81      }
82
83      // Calculate need matrix
84      for (i = 0; i < n; i++) {
85          for (j = 0; j < r; j++) {
86              need[i][j] = max[i][j] - alloc[i][j];
87          }
88      }
89
90      while (flag) {
91          flag = 0;
92          for (i = 0; i < n; i++) {
```

```
87          }
88      }
89
90      while (flag) {
91          flag = 0;
92          for (i = 0; i < n; i++) {
93              int can_execute = 1;
94              if (finish[i] == 0) {
95                  for (j = 0; j < r; j++) {
96                      if (need[i][j] > avail[j]) {
97                          can_execute = 0;
98                          break;
99                      }
100                 }
101                 if (can_execute) {
102                     for (k = 0; k < r; k++) {
103                         avail[k] += alloc[i][k];
104                     }
105                     finish[i] = 1;
106                     flag = 1;
107                 }
108             }
109         }
110     }
111
112     int deadlock_found = 0, dead_count = 0;
113     for (i = 0; i < n; i++) {
114         if (finish[i] == 0) {
115             dead[dead_count++] = i;
116             deadlock_found = 1;
117         }
118     }
119
120     if (deadlock_found) {
121         printf("\n\nSystem is in Deadlock.\nDeadlocked Processes are:\n");
122         for (i = 0; i < dead_count; i++) {
123             printf("P%d\t", dead[i] + 1);
124         }
125         printf("\n");
126     } else {
127         printf("\n\nNo Deadlock Detected. System is in a Safe State.\n");
128     }
129 }
```

```
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********** Deadlock Detection Algorithm ************
Enter the number of Processes:  5
Enter the number of Resource Instances: 3
Enter the Max Matrix:
7 5 3
3 2 2
9 0 2
2 2 2
4 3 3
Enter the Allocation Matrix:
0 1 0
2 0 0
3 0 2
2 1 1
0 0 2
Enter the Available Resources:
3 3 2

Process Allocation      Max             Available
P1      0 1 0   7 5 3   3 3 2
P2      2 0 0   3 2 2
P3      3 0 2   9 0 2
P4      2 1 1   2 2 2
P5      0 0 2   4 3 3


No Deadlock Detected. System is in a Safe State.
```

```
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********** Deadlock Detection Algorithm ************
Enter the number of Processes:  4
Enter the number of Resource Instances: 3
Enter the Max Matrix:
3 2 2
6 1 3
3 1 4
4 2 2
Enter the Allocation Matrix:
1 0 0
5 1 1
2 1 1
0 0 2
Enter the Available Resources:
0 0 0

Process Allocation      Max             Available
P1      1 0 0   3 2 2   0 0 0
P2      5 1 1   6 1 3
P3      2 1 1   3 1 4
P4      0 0 2   4 2 2


System is in Deadlock.
Deadlocked Processes are:
P1      P2      P3      P4
```