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1  #include<stdio.h>
2  #include<stdlib.h>
3  #include<string.h>
4  int canalloc = 0;
5  void findsafesequence(int n, int m, int alloc[n][m], int max[n][m], int avail[m], int
need[n][m]) {
6      int y = 0;
7      int f[n], ans[n], ind = 0;
8      // Initialize finish array to 0
9      for (int k = 0; k < n; k++) {
10         f[k] = 0;
11     }
12     for (int k = 0; k < n; k++) {
13         for (int i = 0; i < n; i++) {
14             if (f[i] == 0) { // Process i has not finished
15                 int flag = 0;
16                 for (int j = 0; j < m; j++) {
17                     if (need[i][j] > avail[j]) {
18                         flag = 1; // If resources can't be allocated to process i
19                         break;
20                     }
21                 }
22                 if (flag == 0) { // If process i can be allocated resources
23                     ans[ind++] = i; // Add process i to safe sequence
24                     for (int y = 0; y < m; y++) {
25                         avail[y] += alloc[i][y]; // Release resources after process
finishes
26                     }
27                     f[i] = 1; // Mark process as finished
28                 }
29             }
30         }
31     }
32     int flag = 1;
33     for (int i = 0; i < n; i++) {
34         if (f[i] == 0) { // If some process could not finish
35             canalloc = -1;
36             flag = 0;
37             printf("The system is not in a safe state.\n");
38             break;
39         }
40     }
41     if (flag == 1) {
42         canalloc = 1;
43         printf("The system is in a safe state.\n");
44         printf("Safe Sequence: ");
45         for (int i = 0; i < n - 1; i++) {
46             printf("P%d -> ", ans[i]);
47         }
48         printf("P%d\n", ans[n - 1]);
49
50         printf("\nFinal Available matrix\n");
51         for (int i = 0; i < m; i++) {
52             printf("%d ", avail[i]);
53         }
54         printf("\n");
55     }
56 }
57 int main() {
58     int n, m;
59     printf("Enter the number of processes: ");
60     scanf("%d", &n);
61     printf("Enter the number of resources: ");
62     scanf("%d", &m);
63     int alloc[n][m], max[n][m], avail[m];
64     printf("Enter the Allocation Matrix (%dx%d): \n", n, m);
65     for (int i = 0; i < n; i++) {
66         for (int j = 0; j < m; j++) {
67             scanf("%d", &alloc[i][j]);
68         }
69     }
70     printf("Enter the Maximum Matrix (%dx%d): \n", n, m);
71     for (int i = 0; i < n; i++) {

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72     for (int j = 0; j < m; j++) {
73         scanf("%d", &max[i][j]);
74     }
75 }
76 printf("Enter the Available Resources for %d resources: \n", m);
77 for (int i = 0; i < m; i++) {
78     scanf("%d", &avail[i]);
79 }
80 int need[n][m];
81 for (int i = 0; i < n; i++) {
82     for (int j = 0; j < m; j++) {
83         need[i][j] = max[i][j] - alloc[i][j];
84     }
85 }
86 printf("The need matrix is:\n");
87 for (int i = 0; i < n; i++) {
88     for (int j = 0; j < m; j++) {
89         printf("%d\t", need[i][j]);
90     }
91     printf("\n");
92 }
93 int ch;
94 printf("1. Resource request\n");
95 printf("2. Safe sequence\n");
96 printf("Enter your choice: ");
97 scanf("%d", &ch);
98 switch (ch) {
99     case 1: {
100         printf("Enter the process ID for which the request is made: ");
101         int pid;
102         scanf("%d", &pid);
103         printf("Enter the resource request for process %d: ", pid);
104         int req[m];
105         for (int i = 0; i < m; i++) {
106             scanf("%d", &req[i]);
107         }
108         // Check if request can be granted
109         for (int i = 0; i < m; i++) {
110             if (req[i] > need[pid][i]) {
111                 printf("Error: Process has exceeded its maximum claim.\n");
112                 return 0;
113             }
114             if (req[i] > avail[i]) {
115                 printf("Resources are not available. Process must wait.\n");
116                 return 0;
117             }
118         }
119         // Temporarily allocate the resources and check if safe
120         for (int i = 0; i < m; i++) {
121             avail[i] -= req[i];
122             alloc[pid][i] += req[i];
123             need[pid][i] -= req[i];
124         }
125         findsafesequence(n, m, alloc, max, avail, need);
126         if (canalloc == -1) {
127             printf("The resource request cannot be granted immediately.\n");
128         } else {
129             printf("The resource request can be granted immediately.\n");
130         }
131         break;
132     }
133     case 2:
134         findsafesequence(n, m, alloc, max, avail, need);
135         break;
136     case 3: break;
137     default:
138         printf("Invalid choice\n");
139         break;
140 }
141 return 0;
142 }
143

```