**ASHNA.V**

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**Ex.No.9: Deadlock Avoidance**

**Aim:**

To find out a safe sequence using Banker’s algorithm for deadlock avoidance.

Code:

#include <stdio.h>

#include <stdbool.h>

int main() {

int n, r;

// Step 1: Get input for processes and resources

printf("Enter number of processes: ");

scanf("%d", &n);

printf("Enter number of resource types: ");

scanf("%d", &r);

int Allocation[n][r], Max[n][r], Need[n][r], Available[r];

// Allocation Matrix Input

printf("Enter Allocation Matrix:\n");

for (int i = 0; i < n; i++)

for (int j = 0; j < r; j++)

scanf("%d", &Allocation[i][j]);

// Max Matrix Input

printf("Enter Max Matrix:\n");

for (int i = 0; i < n; i++)

for (int j = 0; j < r; j++)

scanf("%d", &Max[i][j]);

// Available Resources

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

for (int j = 0; j < r; j++)

scanf("%d", &Available[j]);

// Step 2: Calculate Need = Max - Allocation

for (int i = 0; i < n; i++)

for (int j = 0; j < r; j++)

Need[i][j] = Max[i][j] - Allocation[i][j];

// Step 3: Initialize Work = Available and Finish[i] = false

int Work[r];

for (int j = 0; j < r; j++)

Work[j] = Available[j];

bool Finish[n];

for (int i = 0; i < n; i++)

Finish[i] = false;

int SafeSequence[n], count = 0;

// Step 4: Find a process that can be completed

while (count < n) {

bool found = false;

for (int i = 0; i < n; i++) {

if (!Finish[i]) {

bool canRun = true;

for (int j = 0; j < r; j++) {

if (Need[i][j] > Work[j]) {

canRun = false;

break;

}

}

if (canRun) {

// Step 5: Work = Work + Allocation[i]

for (int j = 0; j < r; j++)

Work[j] += Allocation[i][j];

// Mark process as finished

Finish[i] = true;

SafeSequence[count++] = i;

found = true;

}

}

}

if (!found) {

// Step 6: No such process found

printf("\nNo safe sequence exists. System is in unsafe state.\n");

return 0;

}

}

// Step 7: All processes are finished

printf("\nSystem is in a SAFE state.\nSafe sequence is: ");

for (int i = 0; i < n; i++)

printf("P%d ", SafeSequence[i]);

printf("\n");

return 0;

}

Input:

Enter number of processes: 5

Enter number of resource types: 3

Enter Allocation Matrix:

0 1 0

2 0 0

3 0 2

2 1 1

0 0 2

Enter Max Matrix:

7 5 3

3 2 2

9 0 2

2 2 2

4 3 3

Enter Available Resources:

3 3 2

Output:

System is in a SAFE state.

Safe sequence is: P1 P3 P4 P0 P2