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GitHub Link: https://github.com/iamsahilshukla/cse316-os-prjoject.git

complexity:-O(n+nm)=O(n*m)
Algo-Brute Force

Question:24 Consider following and Generate a solution in C to find whether the system is in safe state or not?

Available				Processes	Allocation				Max			
A	B	C	D		A	B	C	D	A	B	C	D
1	5	2	0	P0	0	0	1	2	0	0	1	2
				P1	1	0	0	0	1	7	5	0
				P2	1	3	5	4	2	3	5	6
				P3	0	6	3	2	0	6	5	2
				P4	0	0	1	4	0	6	5	6

Description:-

The banker's algorithm is a resource allocation and deadlock avoidance algorithm that tests for safety by simulating the allocation for predetermined maximum possible amounts of all resources, then makes an "s-state" check to test for possible activities, before deciding whether allocation should be allowed to continue.

Let **'n'** be the number of processes in the system and **'m'** be the number of resources types.

Available :

- It is a 1-d array of size **'m'** indicating the number of available resources of each type.
- Available[i] = k means there are **'k'** instances of resource type $\mathbf{R_j}$

Max :

- It is a 2-d array of size '**n*m'** that defines the maximum demand of each process in a system.
- Max[i, j] = k means process $\mathbf{P_i}$ may request at most **'k'** instances of resource type $\mathbf{R_j}$.

Allocation :

- It is a 2-d array of size **'n*m'** that defines the number of resources of each type currently allocated to each process.
- Allocation[i, j] = k means process $\mathbf{P_i}$ is currently allocated **'k'** instances of resource type $\mathbf{R_j}$

Need :

- It is a 2-d array of size **'n*m'** that indicates the remaining resource need of each process.
- Need [i, j] = k means process $\mathbf{P_i}$ currently need **'k'** instances of resource type $\mathbf{R_j}$

for its execution.

- Need [i, j] = Max [i, j] – Allocation [i, j]

Code:-(Predefined values in the code)

```
/* Question 23-- Consider following and Generate a solution in C to find whether the system is in safe state or

    Available        Processes        Allocation                  Max
 A   B   C   D                     A    B    C    D        A    B    C    D
 1   5   2   0          P0         0    0    1    2        0    0    1    2
                        P1         1    0    0    0        1    7    5    0
                        P2         1    3    5    4        2    3    5    6
                        P3         0    6    3    2        0    6    5    2
                        P4         0    0    1    4        0    6    5    6


#include <stdio.h>
int main()
{
    // P0, P1, P2, P3, P4 are the Process names here

    int n, m, i, j, k;//declaration of variables
    n = 5; // Indicates the total number of processes of the system
    m = 4; // Indicates the total number of resources in the system
    int alloc[5][4] = { { 0, 0, 1, 2 }, // P0    // Allocation Matrix
                        { 1, 0, 0, 0 }, // P1    // Indicates where the process you have received a resource
                        { 1, 3, 5, 4 }, // P2
                        { 0, 6, 3, 2 }, // P3
                        { 0, 0, 1, 4 } }; // P4

    int max[5][4] = { { 0, 0, 1, 2 }, // P0    // MAX Matrix
                      { 1, 7, 5, 0 }, // P1
                      { 2, 3, 5, 6 }, // P2
                      { 0, 6, 5, 2 }, // P3
                      { 0, 6, 5, 6 } }; // P4

```

```
    int avail[4] = { 1, 5, 2, 0 }; // Available Resources

    int f[n], ans[n], ind = 0;
    for (k = 0; k < n; k++) {       //Sorting the process
        f[k] = 0;
    }
    int need[n][m];                 //Express how many more resources can be allocated in future
    for (i = 0; i < n; i++) {       //Sorting the process
        for (j = 0; j < m; j++)     //Sorting the process
            need[i][j] = max[i][j] - alloc[i][j]; //Need= maximum resources - currently allocated resources
    }
    int y = 0;
    for (k = 0; k < 5; k++) {
        for (i = 0; i < n; i++) {
            if (f[i] == 0) {

                int flag = 0;
                for (j = 0; j < m; j++) {
                    if (need[i][j] > avail[j]){
                        flag = 1;
                         break;
                    }
                }

                if (flag == 0) {
                    ans[ind++] = i;
                    for (y = 0; y < m; y++)
                        avail[y] += alloc[i][y];
                    f[i] = 1;
                }
```

```
            }
        }
    }

    printf("Following is the SAFE Sequence\n");
    for (i = 0; i < n - 1; i++)             //Sorting the process for safe state.
        printf(" P%d ->", ans[i]);          //Printing all hte process in safe state order
        printf(" P%d", ans[n - 1]);

    return (0);

}
```

```
C:\Users\bhave\Documents\ca2.exe
Following is the SAFE Sequence
 P0 -> P2 -> P3 -> P4 -> P1
--------------------------------
Process exited after 0.0208 seconds with return value 0
Press any key to continue . . .
```

Output:-

Code:-(User is asked to enter the values)

```c
    {
        for(i=0;i<num;i++)                                  //Sorting the process
        {
            c=0;
            for(j=0;j<n;j++)                                    //Sorting the process
            {
                if(arr[i]==1) break;
                if(need[i][j]<=avail[j])
                {
                    c++;
                }
                if(c==n)
                {
                    for(j=0;j<n;j++)
                    {
                        avail[j]+=alloc[i][j];
                    }
                    printf("p%d\t ->",i);  arr[i]=1;     c1++;
                }
            }
        }
        k++;
    }
}
```

```c
    printf("\n Enter allocation matrix(INTEGER) with one space after each integer  \n");   //Allocation Matrix
    printf("\n       A B C D \n");            //For pretty formatting output
    for(i=0;i<num;i++)
    {
        printf("p%d     ",    i);          arr[i]=0;       //to print the process number
        for(j=0;j<n;j++)
        {
            scanf("%d",    &alloc[i][j]);
        }
    }
    printf("\n Enter MAX matrix(INTEGER) with one space after each integer  \n");        //MAX Matrix
    printf("\n       A B C D \n");           //For pretty formatting output
    for(i=0;i<num;i++)                                  //Sorting the process
    {
        printf("p%d     ",    i);                         //to print the process number
        for(j=0;j<n;j++)                                  //Sorting the process
        {
            scanf("%d",&max[i][j]);
        }
    }
    for(i=0;i<num;i++)                                  //Sorting the process
    {
        printf("\np%d\t",i) ;
        for(j=0;j<n;j++)                                  //Sorting the process
        {
            need[i][j]=max[i][j]-alloc[i][j];                //Need= maximum resources - currently allocated resources
            printf("\t%d",need[i][j]);
        }
    }
    k=0;     c1=0;
    printf("\n\n");
    while(k<15)
```

```
/* Question 24-- Consider following and Generate a solution in C to find whether the system is in safe state or not?

    Available       Processes       Allocation                  Max
 A   B   C   D                    A    B    C    D        A    B    C    D
 1   5   2   0         P0         0    0    1    2        0    0    1    2
                        P1         1    0    0    0        1    7    5    0
                        P2         1    3    5    4        2    3    5    6
                        P3         0    6    3    2        0    6    5    2
                        P4         0    0    1    4        0    6    5    6


#include<stdio.h>
int main()
{
    int num;
    int n;
    int i,j,k,c,c1;
    int avail[20],arr[10];
    int need[20][20],alloc[20][20],max[20][20];

    printf("\nEnter number of processes :");
    scanf("%d",&num);

    printf("\nEnter the number of resources available :");
    scanf("%d",&n);

    printf("\nEnter instances for resources(Press enter after entering each integer value) :\n");
    for(i=0;i<n;i++)
    {
        printf("R%d    ",i+1);
        scanf("%d",&avail[i]);
    }
```

C:\Users\bhave\Desktop\CA\user_input.exe

```
Enter number of processes :5

Enter the number of resources available :4

Enter instances for resources(Press enter after entering each integer value) :
R1    1
R2    5
R3    2
R4    0

 Enter allocation matrix(INTEGER) with one space after each integer

       A B C D
p0     0 0 1 2
p1     1 0 0 0
p2     1 3 5 4
p3     0 6 3 2
p4     0 0 1 4

 Enter MAX matrix(INTEGER) with one space after each integer

       A B C D
p0     0 0 1 2
p1     1 7 5 0
p2     2 3 5 6
p3     0 6 5 2
p4     0 6 5 6

p0             0       0       0       0
p1             0       7       5       0
p2             1       0       0       2
p3             0       0       2       0
p4             0       6       4       2

p0       ->p2    ->p3    ->p4    ->p1    ->
--------------------------------
Process exited after 56.9 seconds with return value 5
Press any key to continue . . .
```

Q3. Write a multithreaded program in C that outputs prime numbers. This program should work as follows: The user will run the program and will enter a number on the command line. The program will then create a separate thread that outputs all the prime numbers less than or equal to the number entered by the user.

Description:-

According to question the user will enter a number in the command line then the program will create a separate thread that outputs all the prime numbers less than or equal to the number entered by the user.

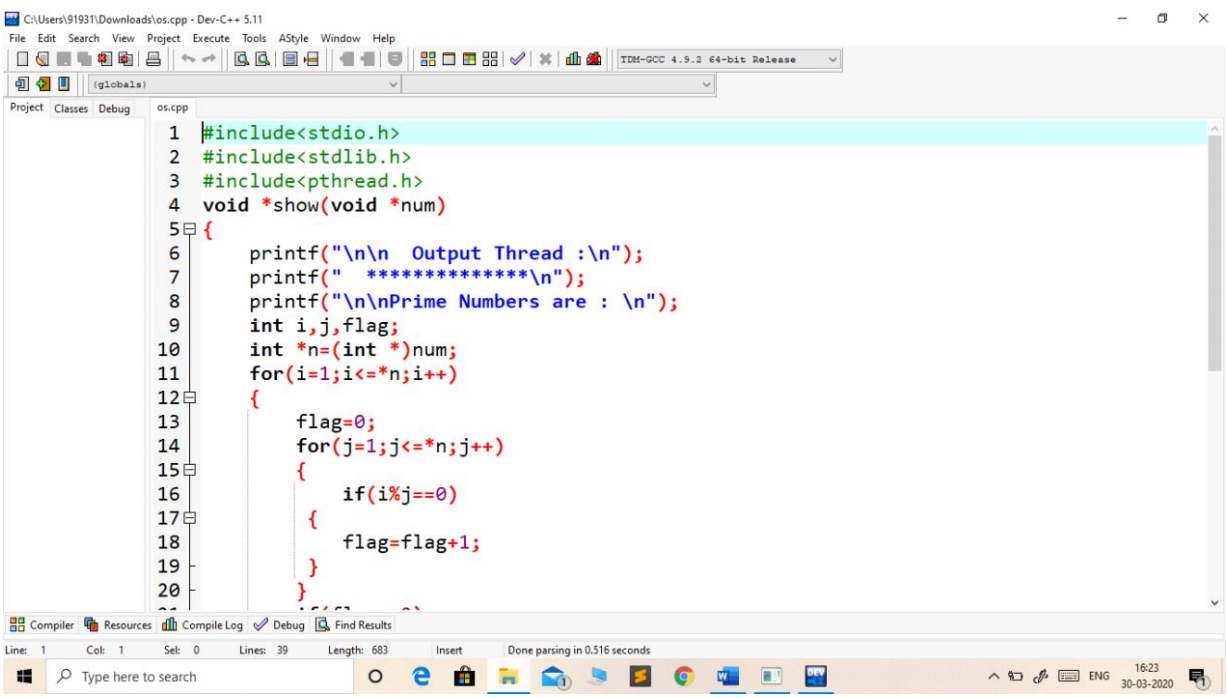
After compiling the code when we will run the code that according to the number entered it will create separate thread that will give us all the prime numbers less than or equal to the number entered by us.

Algorithm:-

Rough Logic

Complexity:- O(n^3)

Code-



C:\Users\91931\Downloads\os.cpp - Dev-C++ 5.11

```c
#include<stdio.h>
#include<stdlib.h>
#include<pthread.h>
void *show(void *num)
{
    printf("\n\n  Output Thread :\n");
    printf("  **************\n");
    printf("\n\nPrime Numbers are : \n");
    int i,j,flag;
    int *n=(int *)num;
    for(i=1;i<=*n;i++)
    {
        flag=0;
        for(j=1;j<=*n;j++)
        {
            if(i%j==0)
        {
            flag=flag+1;
        }
        }
```

C:\Users\91931\Downloads\os1.exe

```
  Input Thread :
  *************


  Enter a number upto which prime numbers are required:-
52


  Output Thread :
  **************


Prime Numbers are :
2 3 5 7 11 13 17 19 23 29 31 37 41 43 47
--------------------------------
Process exited after 5.904 seconds with return value 0
Press any key to continue . . .
```

C:\Users\91931\Downloads\os.exe

```
  Input Thread :
  *************


  Enter a number upto which prime numbers are required:-
122


  Output Thread :
  **************


Prime Numbers are :
2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 71 73 79 83 89 97 101 103 107 109 113
--------------------------------
Process exited after 19.98 seconds with return value 0
Press any key to continue . . .
```

Type here to search

ENG 19:34 30-03-2020