Experiment no. 7

Aim: Write a C program for the memory management algorithm.

Theory: Memory Management is the process of controlling and coordinating computer memory, assigning portions known as blocks to various running programs to optimize the overall performance of the system.

It is the most important function of an operating system that manages primary memory. It helps processes to move back and forward between the main memory and execution disk. It helps OS to keep track of every memory location, irrespective of whether it is allocated to some process or it remains free.

In **Partition Allocation**, when there is more than one partition freely available to accommodate a process's request, a partition must be selected. To choose a particular partition, a partition allocation method is needed. A partition allocation method is considered better if it avoids internal fragmentation.

When it is time to load a process into the main memory and if there is more than one free block of memory of sufficient size then the OS decides which free block to allocate.

There are different Placement Algorithm:

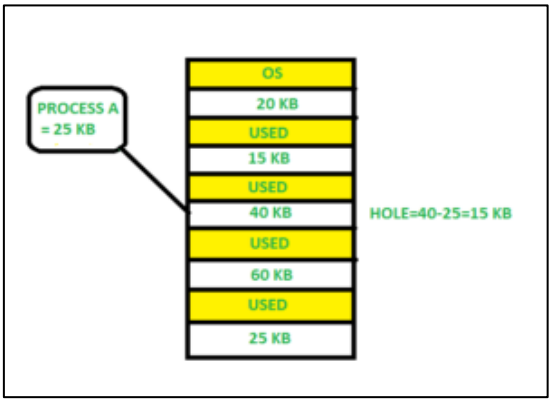
A. First Fit

B. Best Fit

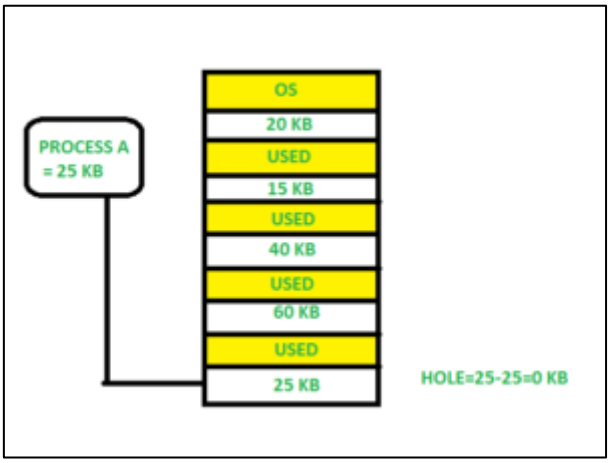
C. Worst Fit

D. Next Fit

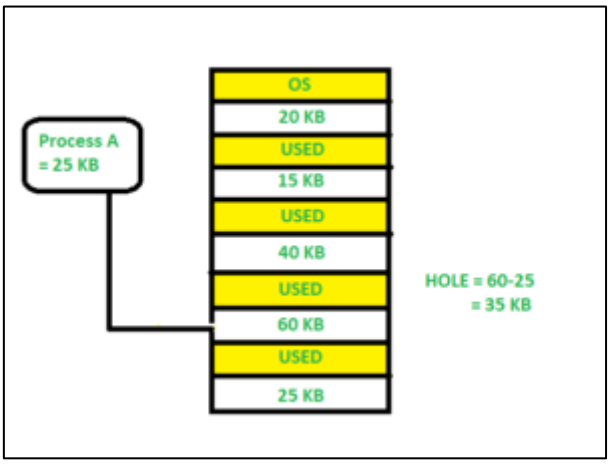
1. First Fit: In the first fit, the partition is allocated which is the first sufficient block from the top of Main Memory. It scans memory from the beginning and chooses the first available block that is large enough. Thus, it allocates the first hole that is large enough.



2. Best Fit Allocate the process to the partition which is the first smallest sufficient partition among the free available partition. It searches the entire list of holes to find the smallest hole whose size is greater than or equal to the size of the process.



3. Worst Fit Allocate the process to the partition which is the largest sufficient among the freely available partitions available in the main memory. It is opposite to the best-fit algorithm. It searches the entire list of holes to find the largest hole and allocate it to process.



4. Next Fit: Next fit is similar to the first fit but it will search for the first sufficient partition from the last allocation point.

Input for the algorithm:

Input: blockSize [] = {100, 500, 200, 300, 600};

processSize [] = {212, 417, 112, 426};

First Fit:

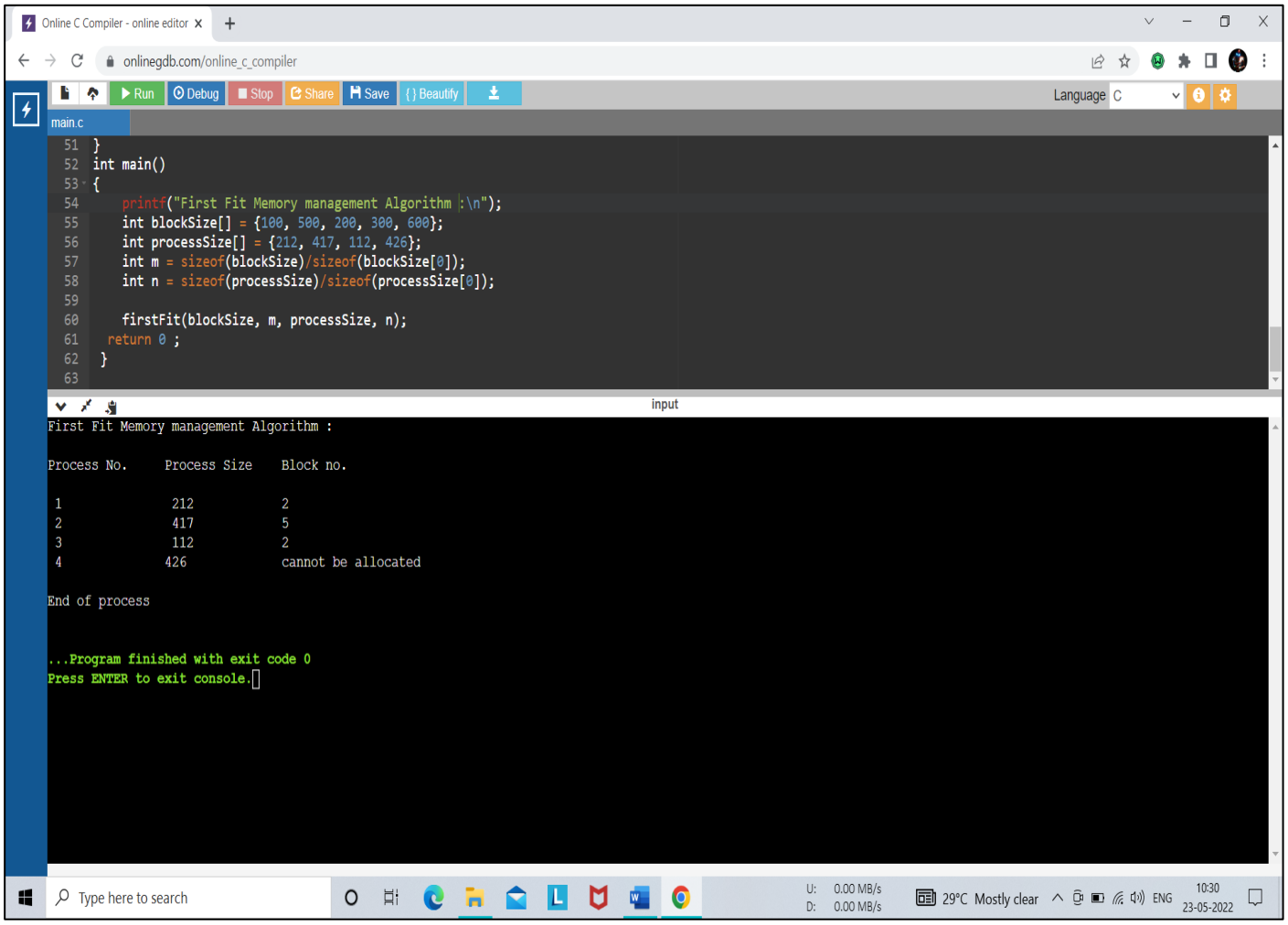
Code:

```
#include <stdio.h>
void firstFit(int blockSize[],int m,int processSize[],int n)
{
   //Block allocations for process
   int allocation[n];
   //Initially allocate the index of -1 to all allocation blocks
   for (int i=0;i<n;i++)
   {
      allocation[i]=-1;
   }
  //Fetching the process
   for (int i=0;i<n;i++)
   {
      //Setting the index with first available block
      int best_idx=-1;
     //Running for-loop over blocksizes
      for (int j=0;j<m;j++)
      {
         //Block has been found
         if (blockSize[j]>=processSize[i])
         {
            best_idx=j;
            break;
         }
      }
  //Cannot be alloted
      if (best_idx==-1)
```

```
            continue;
        //At the end allot the block to process and re-calculate free-space
        blockSize[best_idx]-=processSize[i];
        allocation[i]=best_idx;
    }
   //Now printing the allocation array
    printf("\nProcess No.\tProcess Size\tBlock no.\n");
    for(int i=0;i<n;i++)
    {
        if (allocation[i]!=-1)
            printf("\n %d  \t\t %d \t\t%d",i+1,processSize[i],allocation[i]+1);
        else
            printf("\n %d   \t\t%d  \t\tcannot be allocated",i+1,processSize[i]);
    }
    printf("\n\nEnd of process\n");
}
int main()
{
    int blockSize[] = {100, 500, 200, 300, 600};
    int processSize[] = {212, 417, 112, 426};
    int m = sizeof(blockSize)/sizeof(blockSize[0]);
    int n = sizeof(processSize)/sizeof(processSize[0]);

    firstFit(blockSize, m, processSize, n);
  return 0 ;
 }
```

Output:


Online C Compiler - online editor
onlinegdb.com/online_c_compiler
Run
Debug
Stop
Share
Save
{ } Beautify
Language C
main.c
}
int main()
{
printf("First Fit Memory management Algorithm :\n");
int blockSize[] = {100, 500, 200, 300, 600};
int processSize[] = {212, 417, 112, 426};
int m = sizeof(blockSize)/sizeof(blockSize[0]);
int n = sizeof(processSize)/sizeof(processSize[0]);
firstFit(blockSize, m, processSize, n);
return 0 ;
}
input
First Fit Memory management Algorithm :
Process No. Process Size Block no.
1 212 2
2 417 5
3 112 2
4 426 cannot be allocated
End of process
...Program finished with exit code 0
Press ENTER to exit console.
Type here to search
U: 0.00 MB/s
D: 0.00 MB/s
29°C Mostly clear
ENG
10:30
23-05-2022

Next Fit:

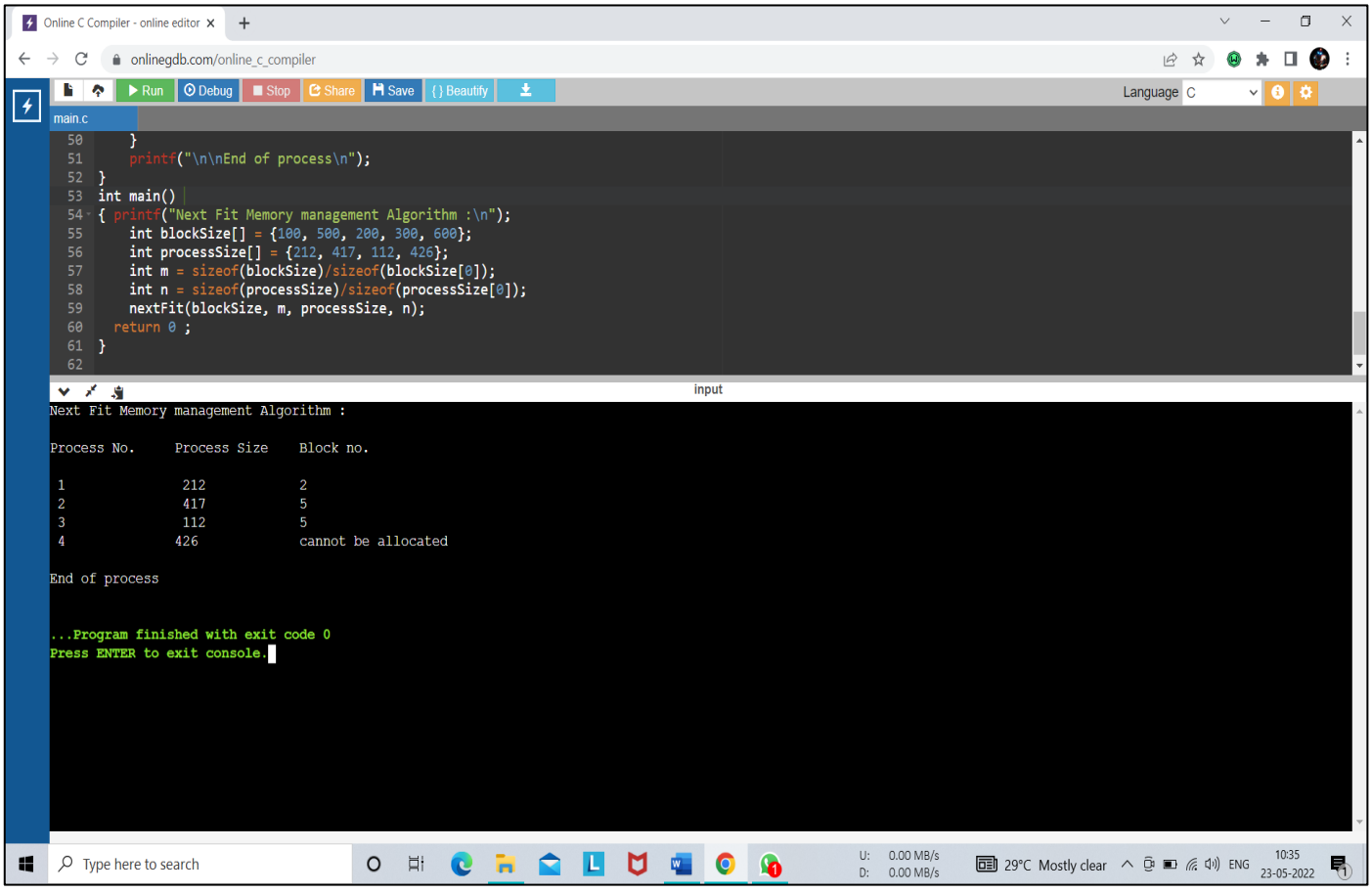
Code:

```
#include <stdio.h>
void nextFit(int blockSize[],int m,int processSize[],int n)
{
    //Block allocations for process
    int allocation[n];
//Initially allocate the index of -1 to all allocation blocks
    for (int i=0;i<n;i++)
    {
        allocation[i]=-1;
    }
 //Pointer to keep track of where last allocation was made
    int j=0;
    //Counter to keep track of how many blocks have been visited
   //Fetching the process and allocating block
    for (int i = 0; i < n; i++) {
     int count=0;
        // Do not start from beginning
        while (count < m)
        {
            if (blockSize[j] >= processSize[i])
```

```
{
  // allocate block j to p[i] process
            allocation[i] = j;
  // Reduce available memory in this block.
            blockSize[j] -= processSize[i];
         break;
          }
  // mod m will help in traversing the blocks from
          // starting block after we reach the end.
          j = (j + 1) % m;
          count+=1;
       }
   }
 //Now printing the allocation array
   printf("\nProcess No.\tProcess Size\tBlock no.\n");
   for(int i=0;i<n;i++)
   {
      if (allocation[i]!=-1)
          printf("\n %d  \t\t %d \t\t%d",i+1,processSize[i],allocation[i]+1);
      else
          printf("\n %d   \t\t%d  \t\tcannot be allocated",i+1,processSize[i]);
   }
```

```
    printf("\n\nEnd of process\n");
}
int main()
{int blockSize[] = {100, 500, 200, 300, 600};
    int processSize[] = {212, 417, 112, 426};
    int m = sizeof(blockSize)/sizeof(blockSize[0]);
    int n = sizeof(processSize)/sizeof(processSize[0]);
    nextFit(blockSize, m, processSize, n);
  return 0 ;
}
```

Output:



Worst Fit:

Code:

```
#include <stdio.h>
void worstFit(int blockSize[],int m,int processSize[],int n)
{
    //Block allocations for process
    int allocation[n];
    //Initially allocate the index of -1 to all allocation blocks
    for (int i=0;i<n;i++)
    {
        allocation[i]=-1;
    }
//Fetching the process
    for (int i=0;i<n;i++)
    {
        //Setting the index with maximal wastage
        int worst_idx=-1;
        //Keeping the track of free space in best block
       //Running for-loop over blocksizes
        for (int j=0;j<m;j++)
        {
            if (blockSize[j]>=processSize[i])
```

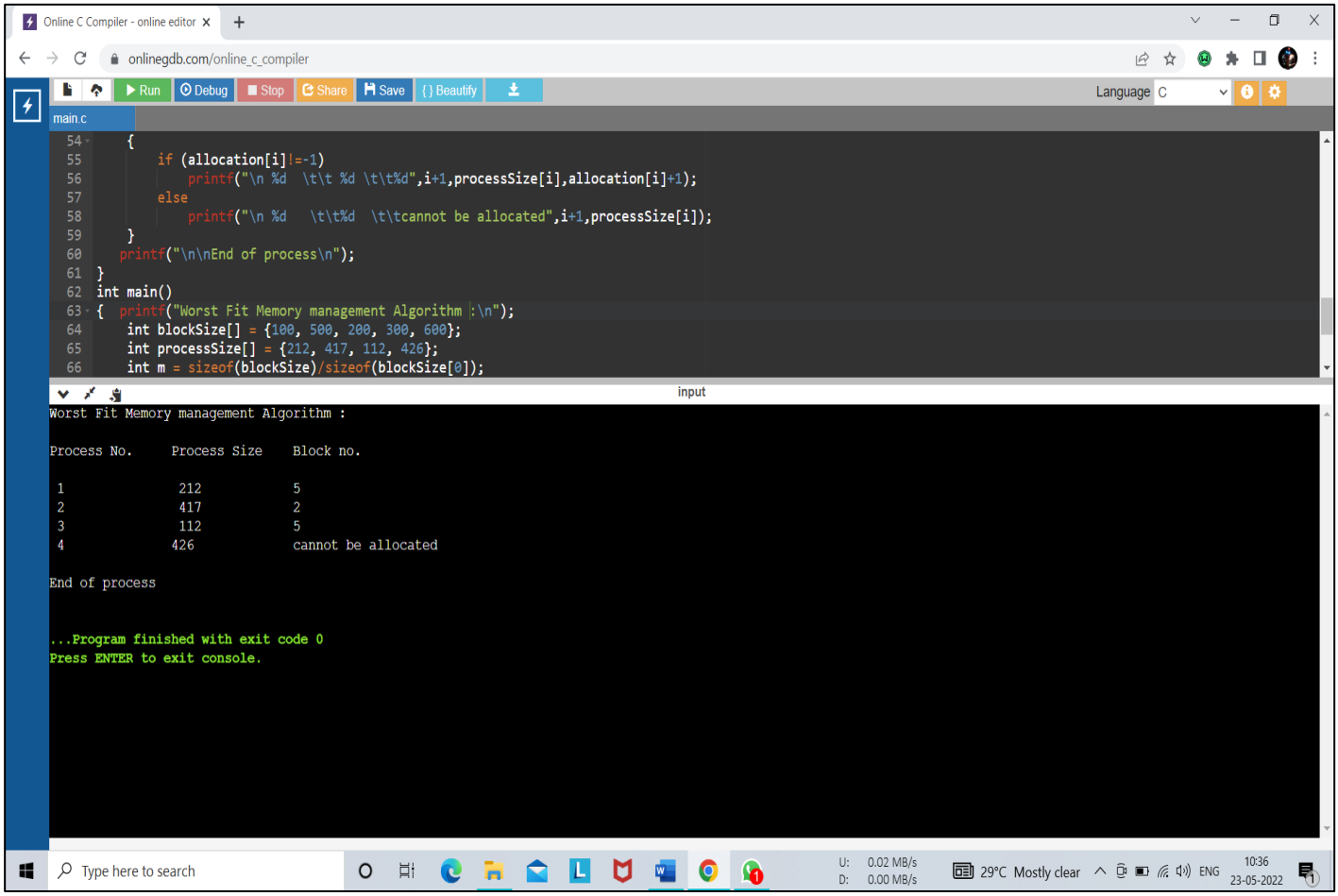
```
            {
                //Choosing first block as the best allocated block
                if (worst_idx==-1)
                {
                    worst_idx=j;
                }
                else
                {
                  //Check if this free space is less than that of current best
                    if (blockSize[worst_idx]<blockSize[j])
                    {
                        worst_idx=j;
                    }
                }
            }
        }
          if (worst_idx==-1)
            continue;
//At the end allot the block to process and re-calculate free-space
        blockSize[worst_idx]-=processSize[i];
        allocation[i]=worst_idx;
    }
```

```
  //Now printing the allocation array
   printf("\nProcess No.\tProcess Size\tBlock no.\n");
   for(int i=0;i<n;i++)
   {
      if (allocation[i]!=-1)
         printf("\n %d  \t\t %d \t\t%d",i+1,processSize[i],allocation[i]+1);
      else
         printf("\n %d   \t\t%d  \t\tcannot be allocated",i+1,processSize[i]);
   }
  printf("\n\nEnd of process\n");
}
int main()
{
   int blockSize[] = {100, 500, 200, 300, 600};
   int processSize[] = {212, 417, 112, 426};
   int m = sizeof(blockSize)/sizeof(blockSize[0]);
   int n = sizeof(processSize)/sizeof(processSize[0]);

   worstFit(blockSize, m, processSize, n);

   return 0 ;
}
```

Output:


Online C Compiler - online editor
onlinegdb.com/online_c_compiler
Run
Debug
Stop
Share
Save
{ } Beautify
Language C
main.c
54 {
55 if (allocation[i]!=-1)
56 printf("\n %d \t\t %d \t\t%d",i+1,processSize[i],allocation[i]+1);
57 else
58 printf("\n %d \t\t%d \t\tcannot be allocated",i+1,processSize[i]);
59 }
60 printf("\n\nEnd of process\n");
61 }
62 int main()
63 { printf("Worst Fit Memory management Algorithm :\n");
64 int blockSize[] = {100, 500, 200, 300, 600};
65 int processSize[] = {212, 417, 112, 426};
66 int m = sizeof(blockSize)/sizeof(blockSize[0]);
input
Worst Fit Memory management Algorithm :
Process No. Process Size Block no.
1 212 5
2 417 2
3 112 5
4 426 cannot be allocated
End of process
...Program finished with exit code 0
Press ENTER to exit console.
Type here to search
U: 0.02 MB/s
D: 0.00 MB/s
29°C Mostly clear
ENG
10:36
23-05-2022

Best Fit:

Code:

```
#include <stdio.h>
void bestFit(int blockSize[],int m,int processSize[],int n)
{
    //Block allocations for process
    int allocation[n];
//Initially allocate the index of -1 to all allocation blocks
    for (int i=0;i<n;i++)
    {
        allocation[i]=-1;
    }
//Fetching the process
    for (int i=0;i<n;i++)
    {
        //Setting the index with minimal wastage
        int best_idx=-1;
        //Keeping the track of free space in best block
        int diff;
        //Running for-loop over blocksizes
        for (int j=0;j<m;j++)
        {
```

```
    if (blockSize[j]>=processSize[i])
    {
        //Choosing first block as the best allocated block
        if (best_idx==-1)
        {
            diff=blockSize[j]-processSize[i];
            best_idx=j;
        }
        else
        {
            int inter=blockSize[j]-processSize[i];
            //Check if this free space is less than that of current best
            if (diff>inter)
            {
                diff=inter;
                best_idx=j;
            }
        }
    }
}

if (best_idx==-1)
```

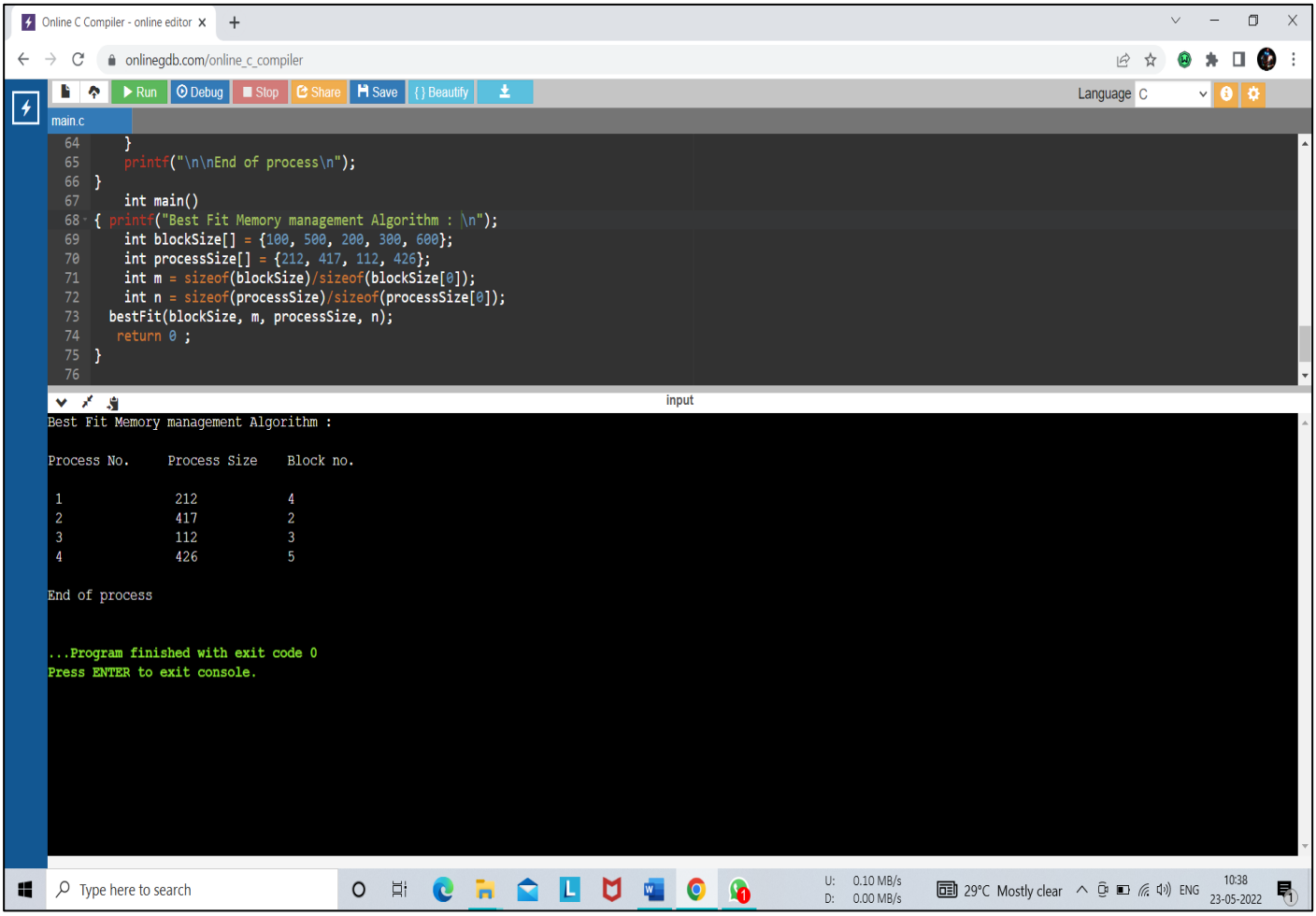
```
            continue;
    //At the end allot the block to process and re-calculate free-space
        blockSize[best_idx]-=processSize[i];
        allocation[i]=best_idx;
    }
   //Now printing the allocation array
    printf("\nProcess No.\tProcess Size\tBlock no.\n");
    for(int i=0;i<n;i++)
    {
        if (allocation[i]!=-1)
            printf("\n %d  \t\t %d \t\t%d",i+1,processSize[i],allocation[i]+1);
        else
            printf("\n %d   \t\t%d  \t\tcannot be allocated",i+1,processSize[i]);
    }
    printf("\n\nEnd of process\n");
}
    int main()
{
    int blockSize[] = {100, 500, 200, 300, 600};
    int processSize[] = {212, 417, 112, 426};
    int m = sizeof(blockSize)/sizeof(blockSize[0]);
    int n = sizeof(processSize)/sizeof(processSize[0]);
```

```
  bestFit(blockSize, m, processSize, n);

   return 0 ;

}
```

Output:



Conclusion:

Here, we performed memory management algorithm like First fit, Next fit, Worst fit, Best fit practical using C programming language.