Q) Implement Johnson Trotter algorithm to generate permutations.

```
CODE-
#include <stdio.h>
#include <stdlib.h>
int flag = 0;
int swap(int *a,int *b) {
int t = *a;
*a = *b;
*b = t;
}
int search(int arr[],int num,int mobile)
{
int g;
for(g=0;g<num;g++) {
if(arr[g] == mobile)
return g+1;
else
flag++;
}
return -1;
}
int find_Moblie(int arr[],int d[],int num)
{
int mobile = 0;
int mobile_p = 0;
int i;
for(i=0;i<num;i++)
if((d[arr[i]-1] == 0) && i != 0)
```

```
{
if(arr[i]>arr[i-1] && arr[i]>mobile_p)
mobile = arr[i];
mobile_p = mobile;
}
else
flag++;
else if((d[arr[i]-1] == 1) & i != num-1)
{
if(arr[i]>arr[i+1] && arr[i]>mobile_p)
{
mobile = arr[i];
mobile_p = mobile;
else
flag++;
}
else
flag++;
}
if((mobile_p == 0) \&\& (mobile == 0))
return 0;
else
return mobile;
}
void permutations(int arr[],int d[],int num)
{
```

```
int i;
int mobile = find_Moblie(arr,d,num);
int pos = search(arr,num,mobile);
if(d[arr[pos-1]-1]==0)
swap(&arr[pos-1],&arr[pos-2]);
else
swap(&arr[pos-1],&arr[pos]);
for(int i=0;i<num;i++)</pre>
{
if(arr[i] > mobile)
{
if(d[arr[i]-1]==0)
d[arr[i]-1] = 1;
else
d[arr[i]-1] = 0;
for(i=0;i<num;i++)
{
printf(" %d ",arr[i]);
}}
int factorial(int k)
{
int f = 1;
int i = 0;
for(i=1;i<k+1;i++)
f = f*i;
return f;
}
```

```
int main()
int num = 0;
int i;
int j;
int z = 0;
printf("Johnson trotter algorithm to find all permutations of given numbers\n");
printf("Enter the number\n");
scanf("%d",&num);
int arr[num],d[num];
z = factorial(num);
printf("total permutations = %d",z);
printf("\nAll possible permutations are: \n");
for(i=0;i<num;i++)
{
d[i] = 0;
arr[i] = i+1;
printf(" %d ",arr[i]);
}
printf("\n");
for(j=1;j<z;j++) {
permutations(arr,d,num);
printf("\n");
return 0;
}
```

```
Enter the number
total permutations = 24
All possible permutations are:
       3
      4
         3
   4
      2
         3
      2
         3
      3
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   4
      3
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      4
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         4
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         2
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         1
 3
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   2
         1
 3
       1
         4
       1
         4
      4
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   4 3 1
   2 3 1
 2
 2
      4
   1
         3
Process returned 0 (0x0)
                          execution time : 3.463 s
Press any key to continue.
```

Q) write a c code for merge sort

```
#include<stdio.h>
void main(){
  int low=0,high,i,n;
  int arr[15];
  printf("Enter the number of elements in the array\n");
  scanf("%d",&n);
  high=n-1;
  printf("Enter the elements of the array\n");
  for(i=0;i<n;i++){
    scanf("%d",&arr[i]);</pre>
```

```
}
  mergeSort(low,high,n,arr);
  printf("Sorted array is : ");
  for(i=0;i<n;i++){
    printf("%d ",arr[i]);
  }
}
void mergeSort(int low,int high,int n,int arr[n])
{
  int mid;
  if(low<high)
  {
    mid=(low+high)/2;
    mergeSort(low,mid,n,arr);
    mergeSort(mid+1,high,n,arr);
    merge(low,mid,high,n,arr);
  }
}
void merge(int low,int mid,int high,int n,int arr[n])
{
  int i=low,j=mid+1,k=low,c[n];
  while(i<=mid&&j<=high)
  {
    if(arr[i]<arr[j])</pre>
    {
      c[k]=arr[i];
      i++;
```

```
k++;
       }
       else
      {
          c[k]=arr[j];
          j++;
          k++;
      }
   }
   while(i<=mid)
   {
      c[k]=arr[i];
      i++;
      k++;
   }
   while(j<=high)
      c[k]=arr[j];
      j++;
      k++;
   }
   for (i = low; i <= high; i++)
   {
      arr[i]=c[i];
}
Enter the number of elements in the array
8
Enter the elements of the array
88 41 12 10 59 87 60 45
Sorted array is : 10 12 41 45 59 60 87 88
Process returned 8 (0x8) execution time : 30.043 s
Press any key to continue.
```



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	permutations.	(1) (10)
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	int t = *a;	
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	int search (int arr [], int num, int mobi	le) 3213
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	for 1 a = 0; q < num; q++) \$	ورزن
	for (g = 0; g < num; g++)\$ if larr [g) = = mobile)	TER poll
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	return -1;	enriquettal
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-	\$	Valuable 1	2
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	if (d[arr[i]-1] ==0)
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	d [arr[1]-1]=0;
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	Printf 1" y.d", arr (12);
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	for 11=1; 12kt1; itt) . radmin and 1210)
	1=1*1;
	return f; BG = 2000 do lugred 1010
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	int num=0; 2 & 2
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	int j ? P S E I P
	int x = 0; 2 x 1 int
	Printf ("bhoson tratter algorithm to find all permutations
	of given numbers \n").
	Printf l'enter the number (n');
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	int arr (num), d (num);
	x=factorial (num);
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	print + 1" In All possible permutations are: \n");
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	while (i'z = high)	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
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