STACK USING ARRAY

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
#define MAX 100
int st[MAX];
int top = -1;
void push(int);
void pop();
void peek();
void display();
int main(){
        while(1){
                printf("\n1.push 2.pop 3.peek 4.display 5.exit\n");
                print("enter your choice: ");
                int ch, num;
                scanf("%d", &ch);
                switch(ch){
                        case 1:
                                printf("\nenter the number : ");
                                scanf("%d", &num);
                                push(num);
                                break;
                        case 2:
                                pop();
                                break;
                        case 3:
                                peek();
                                break;
                        case 4:
                                display();
```

```
                        break;
                case 5:
                        exit(0);
                }
        }
}
void push(int n){
        if( top == MAX-1 ){
                printf("\nstack over flow");
        }else{
                st[++top] = n;
                printf("\n%d has been pushed", n);
        }
}
void pop(){
        if( top == -1 ){
                printf("\nstack under flow");
        }else{
                printf("\n%d has been popped", st[top--]);
        }
}
void peek(){
        if( top == -1 ){
                printf("\nstack under flow");
        }else{
                printf("\npeek element is : %d", st[top]);
        }
}
void display(){
        if( top == -1 ){
                printf("\nstack under flow");
```

```
        }else{
                int i;
                for(i=top; i>=0; --i){
                        printf("\n[ %d ]", st[i]);
                }
        }
}
```

OUTPUT

```
1.push 2.pop 3.peek 4.display 5.exit
enter your choice: 1
enter the number : 10
10 has been pushed

1.push 2.pop 3.peek 4.display 5.exit
enter your choice: 1
enter the number : 20
20 has been pushed

1.push 2.pop 3.peek 4.display 5.exit
enter your choice: 1
enter the number : 30
30 has been pushed

1.push 2.pop 3.peek 4.display 5.exit
enter your choice: 1
enter the number : 40
40 has been pushed

1.push 2.pop 3.peek 4.display 5.exit
enter your choice: 2
40 has been popped
```

1.push 2.pop 3.peek 4.display 5.exit

enter your choice: 3

peek element is : 30

1.push 2.pop 3.peek 4.display 5.exit

enter your choice: 4

[30]

[20]

[10]

1.push 2.pop 3.peek 4.display 5.exit

enter your choice: 1

enter the number : 70

70 has been pushed

1.push 2.pop 3.peek 4.display 5.exit

enter your choice: 4

[70]

[30]

[20]

[10]

RESULT:

Stack using array was executed successfully

STACK USING LINKED LIST

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
void push(int n);
void pop();
void peek();
void display();
struct Node{
	struct Node *next;
	int val;
}*top;
int main(){
	while( 1 ){
		printf("\n1.push 2.pop 3.peek 4.display 5.exit\n");
		printf("Enter your choice: ");
		int num, ch;
		scanf("%d", &ch);
		switch(ch){
			case 1:
				printf("\nenter number : ");
				scanf("%d", &num);
				push(num);
				break;
			case 2:
				pop();
				break;
			case 3:
				peek();
				break;
			case 4:
```

```
                display();
                break;
            case 5:
                exit(0);
        }
    }
}
void push(int n){
    struct Node *newnode = (struct Node*)malloc(sizeof(struct Node*));
    newnode->val = n;
    if( top == NULL ){
        newnode->next = NULL;
    }else{
        newnode->next = top;
    }
    top = newnode;
    printf("\n%d has been pushed", n);
}
void pop(){
    struct Node *temp = top;
    if(temp==NULL){
        printf("stack under flow");
        return;
    }
    printf("\n%d has been popped", temp->val);
    top = top->next;
    free(temp);
}
void peek(){
    if(top==NULL){
        printf("stack under flow");
```

```
                return;
        }
        printf("peek element is : %d", top->val);
}
void display(){
        struct Node *cur = top;
        if(cur==NULL){
                printf("stack under flow");
                return;
        }
        while( cur != NULL ){
                printf("[ %d ]\n", cur->val);
                cur = cur->next;
        }
}
```

OUTPUT

```
1.push 2.pop 3.peek 4.display 5.exit
Enter your choice: 1
enter number : 10
10 has been pushed

1.push 2.pop 3.peek 4.display 5.exit
Enter your choice: 1
enter number : 20
20 has been pushed

1.push 2.pop 3.peek 4.display 5.exit
Enter your choice: 1
enter number : 30
30 has been pushed
```

1.push 2.pop 3.peek 4.display 5.exit

Enter your choice: 4

[30]

[20]

[10]

1.push 2.pop 3.peek 4.display 5.exit

Enter your choice: 2

30 has been popped

1.push 2.pop 3.peek 4.display 5.exit

Enter your choice: 60

60 has been pushed

1.push 2.pop 3.peek 4.display 5.exit

Enter your choice: 3

peek element is : 60

1.push 2.pop 3.peek 4.display 5.exit

Enter your choice: 4

[60]

[20]

[10]

RESULT:

Stack using linked list was executed successfully

QUEUE USING ARRAY

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
#define MAX 10
int rear = 0, front = 0;
int ar[MAX];
void enqueue(int val){
   if(rear==MAX){
      printf("queue over flow");
      return;
   }
   ar[rear++] = val;
}
int dequeue(){
   if(front==rear){
      printf("queue under flow");
      return -1;
   }
   return ar[front++];
}
void show(){
   if(front==rear){
      printf("queue under flow");
      return ;
   }
   for(int i=front; i<rear; i++) printf("%d ", ar[i]);
}
int main(){
   int num, ch;
   while(!0){
```

```
        printf("\n1.enqueue 2.dequeue 3.show 4.exit\n");
        printf("enter your choice: ");
        scanf("%d", &ch);
        switch(ch){
            case 1:
                printf("\nenter the number: ");
                scanf("%d", &num);
                enqueue(num);
                break;
            case 2:
                printf("\n%d has been deleted",dequeue());
                break;
            case 3:
                show();
                break;
            case 4:
                exit(0);
        }
    }
}
```

OUTPUT

```
1.enqueue 2.dequeue 3.show 4.exit
enter your choice: 1
enter the number: 100
1.enqueue 2.dequeue 3.show 4.exit
enter your choice: 1
enter the number: 200
1.enqueue 2.dequeue 3.show 4.exit
enter your choice: 1
enter the number: 300
```

1.enqueue 2.dequeue 3.show 4.exit

enter your choice: 3

100 200 300

1.enqueue 2.dequeue 3.show 4.exit

enter your choice: 2

100 has been deleted

1.enqueue 2.dequeue 3.show 4.exit

enter your choice: 3

200 300

1.enqueue 2.dequeue 3.show 4.exit

enter your choice: 1

enter the number: 400

1.enqueue 2.dequeue 3.show 4.exit

enter your choice: 1

enter the number: 500

1.enqueue 2.dequeue 3.show 4.exit

enter your choice: 3

200 300 400 500

1.enqueue 2.dequeue 3.show 4.exit

enter your choice: 2

200 has been deleted

1.enqueue 2.dequeue 3.show 4.exit

enter your choice: 3

300 400 500

RESULT:

Queue using array was executed successfully

SINGLY LINKED LIST

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
int size;
struct Node{
   struct Node* next;
   int val;
} *head = NULL;
void insertAtFirst(int val){
   struct Node* newnode = (struct Node*)malloc(sizeof(struct Node));
   newnode->next = NULL;
   newnode->val = val;
   if(head==NULL){
      head = newnode;
      return;
   }
   newnode->next = head;
   head = newnode;
   size++;
   return;
}
void insertAtEnd(int val){
   struct Node* newnode = (struct Node*)malloc(sizeof(struct Node));
   newnode->next = NULL;
   newnode->val = val;
   if(head==NULL){
      head = newnode;
      return;
   }
   struct Node* cur = head;
```

```
    while(cur->next!=NULL) cur = cur->next;
    cur->next = newnode;
    size++;
}
void insertAtMid(int val){
    struct Node* newnode = (struct Node*)malloc(sizeof(struct Node));
    newnode->next = NULL;
    newnode->val = val;
    if(head==NULL){
        head = newnode;
        return;
    }
    int mid = size/2;
    struct Node* cur = head;
    for(int i=0; i<mid; i++) cur = cur->next;
    newnode->next = cur->next;
    cur->next = newnode;
    size++;

}
int deleteAtFirst(){
    struct Node* temp = head;
    int res = temp->val;
    head = temp->next;
    temp = NULL;
    free(temp);
    return res;
}
int deleteAtLast(){
    struct Node* cur = head;
    while(cur->next->next!=NULL) cur = cur->next;
```

```
    int res = cur->next->val;
    cur->next = NULL;
    free(cur->next);
    return res;
}
void show(){
    struct Node* cur = head;
    while(cur!=NULL){
        printf("%d -> ", cur->val);
        cur = cur->next;
    }
}
int main(){
    size = 0;
    int ch, num;
    while(1){
        printf("\n1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show
7.Exit");
        scanf("%d", &ch);
        switch(ch){
            case 1:
                printf("\nenter the element: ");
                scanf("%d", &num);
                insertAtFirst(num);
                break;
            case 2:
                scanf("%d", &num);
                insertAtEnd(num);
                break;
            case 3:
                scanf("%d", &num);
                insertAtMid(num);
```

```
            break;
        case 4:
            printf("%d deleted succesfully\n", deleteAtFirst());
            break;
        case 5:
            printf("%d deleted succesfully\n", deleteAtLast());
            break;
        case 6:
            show();
            break;
        case 7:
            exit(1);
      }
   }
   return 0;
}
```

OUTPUT

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit1

enter the element: 111

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit1

enter the element: 112

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit1

enter the element: 113

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit1

enter the element: 114

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit6

114 -> 113 -> 112 -> 111 ->

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit2
489

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit6
114 -> 113 -> 112 -> 111 -> 489 ->
1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit3
546

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit6
114 -> 113 -> 112 -> 546 -> 111 -> 489 ->

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit5
489 deleted succesfully

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit6
114 -> 113 -> 112 -> 546 -> 111 ->

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit4
114 deleted succesfully

1.Insert at first 2.Insert at end 3.Insert at middle 4.Delete at first 5.Delete at end 6.Show 7.Exit6
113 -> 112 -> 546 -> 111 ->

RESULT:

Singly linked list was executed successfully

POLYNOMIAL ADDITION

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
struct Node{
   int coeff;
   int pow;
   struct Node *next;
};
void create(int coeff, int pow, struct Node** head){
   struct Node* newnode = (struct Node*)malloc(sizeof(struct Node));
   newnode->coeff = coeff;
   newnode->pow = pow;
   newnode->next = NULL;
   if(*head==NULL){
      *head = newnode;
      return;
   }
   struct Node* cur = *head;
   while(cur->next!=NULL){
      cur = cur->next;
   }
   cur->next = (struct Node*)malloc(sizeof(struct Node));
   cur->next = newnode;
}
struct Node* add(struct Node* temp1, struct Node* temp2){
   struct Node* out = NULL;
   while(temp1&&temp2){
      if(temp1->pow>temp2->pow){
         create(temp1->coeff, temp1->pow, &out);
```

```
            temp1 = temp1->next;
        }else if(temp1->pow<temp2->pow){
            create(temp2->coeff, temp2->pow, &out);
            temp2 = temp2->next;
        }else{
            create(temp1->coeff+temp2->coeff, temp1->pow, &out);
            temp1 = temp1->next;
            temp2 = temp2->next;
        }
    }
    while(temp1||temp2){
        if(temp1){
            create(temp1->coeff, temp1->pow, &out);
            temp1 = temp1->next;
        }
        if(temp2){
            create(temp2->coeff, temp2->pow, &out);
            temp2 = temp2->next;
        }
    }
    return out;
}
void print(struct Node* head){
    struct Node* cur = head;
    while(cur!=NULL){
        printf(" %dx^%d +", cur->coeff, cur->pow);
        cur = cur->next;
    }
}
int main(){
    struct Node *poly1 = NULL;
```

```
    struct Node *poly2 = NULL;
    struct Node *res = NULL;
    create(2, 5, &poly1);
    create(5, 4, &poly1);
    create(6, 3, &poly1);
    create(8, 2, &poly1);
    create(12, 1, &poly1);
    create(34, 0, &poly1);

    create(2, 4, &poly2);
    create(7, 3, &poly2);
    create(7, 2, &poly2);
    create(3, 1, &poly2);
    printf("\n");
    print(poly1);
    printf("\n");
    print(poly2);
    printf("\n---------------------------------------\n");
    res = add(poly1, poly2);
    print(res);
    return 0;
}
```

OUTPUT

```
2x^5 + 5x^4 + 6x^3 + 8x^2 + 12x^1 + 34x^0 +
 2x^4 + 7x^3 + 7x^2 + 3x^1 +
---------------------------------------
 2x^5 + 7x^4 + 13x^3 + 15x^2 + 15x^1 + 34x^0 +
```

RESULT:

Polynomial Addition was executed successfully

BINARY SEARCH

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
int search(int*, int, int, int);
int main(){
   int n;
   scanf("%d", &n);
   int* ar = (int*)malloc(n*sizeof(int));
   for(int i=0; i<n; i++) scanf("%d", ar+i);
   int target;
   scanf("%d", &target);
   int index = search(ar, target, 0, n);
   if(index==-1) printf("not found");
   else printf("element found in %d index", (index+1));
}
int search(int* ar, int t, int s, int e){
   if(s<e){
      int mid = (s+e)/2;
      if(*(ar+mid)==t) return mid;
      else if(*(ar+mid)<t) return search(ar, t, mid+1, e);
      else return search(ar, t, s, mid-1);
   }
   return -1;
}
```

OUTPUT

```
10
20 34 37 45 56 58 67 77 89 99
58
element found in 6 index
```

BINARY SEARCH TREE AND TRAVERSAL

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
struct Node{
	int val;
	struct Node* right;
	struct Node* left;
};
struct Node* create(int val){
	struct Node* newnode = (struct Node*)malloc(sizeof(struct Node));
	newnode->val = val;
	newnode->right = NULL;
	newnode->left = NULL;
	return newnode;
}
struct Node* insert(struct Node* root, int val){
	if(root == NULL){
		return create(val);
	}else{
		if(root->val>=val){
			root->left = insert(root->left, val);
		}else{
			root->right = insert(root->right, val);
		}
	}
	return root;
}
void preorder(struct Node* root){
	if(root != NULL){
```

```
                printf("%d ", root->val);
                preorder(root->left);
                preorder(root->right);
        }
}
void inorder(struct Node *root){
        if(root != NULL){
                inorder(root->left);
                printf("%d ", root->val);
                inorder(root->right);
        }
}
void postorder(struct Node *root){
        if(root != NULL){
                postorder(root->left);
                postorder(root->right);
                printf("%d ", root->val);
        }
}
int main()
{
        struct Node* root = NULL;
        int n;
        scanf("%d", &n);
        printf("\nenter the elements: ");
        for(int i=0; i<n; i++){
                int num;
                scanf("%d", &num);
                root = insert(root, num);
        }
        printf("PREORDER\n");
```

```
        preorder(root);
        printf("\n");
        printf("INORDER\n");
        inorder(root);
        printf("\n");
        printf("postORDER\n");
        postorder(root);
}
```

OUTPUT

```
10
enter the elements: 45 67 23 12 10 78 78 8 5 98
PREORDER
45 23 12 10 8 5 67 78 78 98
INORDER
5 8 10 12 23 45 67 78 78 98
POSTORDER
5 8 10 12 23 78 98 78 67 45
```

RESULT:

Binary Search Tree was executed successfully

QUICK SORT

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
int partition(int ar[], int s, int e){
	int pivot = ar[e];
	int i, pind = s;
	for(i=s; i<e; i++){
		if(ar[i]<=pivot){
			int t = ar[i];
			ar[i] = ar[pind];
			ar[pind] = t;
			pind++;
		}
	}
	int t = ar[e];
	ar[e] = ar[pind];
	ar[pind] = t;
	return pind;
}
void sort(int ar[], int s, int e){
	if(s>=e) return;
	int pind = partition(ar, s, e);
	sort(ar, s, pind-1);
	sort(ar, pind+1, e);
}
int main()
{
	int n;
	scanf("%d", &n);
	int ar[n];
```

```
    for(int i=0; i<n; i++) scanf("%d", &ar[i]);
    sort(ar, 0, n);
    printf("\nSorted Array: ");
    for(int i=0; i<n; i++) printf("%d ", ar[i]);
}
```

OUTPUT

```
10
Enter the element:
4
6
5
1
23
45
12
78
22
90
Sorted Array: 1 4 5 6 12 22 23 45 78 90
```

RESULT:

Quick sort was executed successfully

INSERTION SORT

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
int main(){
   int n;
   scanf("%d", &n);
   int ar[n];
   printf("enter the elements: ");
   for(int i=0; i<n; i++) scanf("%d", &ar[i]);
   for(int i=1; i<n; i++){
      int j=i-1;
      int key = ar[i];
      while(j>=0&&ar[j]>key){
         ar[j+1] = ar[j];
         j--;
      }
      ar[j+1] = key;
   }
   for(int i=0; i<n; i++) printf("%d ", ar[i]);
   return 0;
}
```

OUTPUT

```
Enter the size of array : 10
enter the elements: 4 5 1 2 8 7 9 10 3 6
1 2 3 4 5 6 7 8 9 10
```

RESULT:

Insertion sort was executed successfully

SELECTION SORT

PROGRAM

```
#include<stdio.h>
int main(){
	int n;
	printf("enter the size : ");
	scanf("%d", &n);
	printf("\nenter the elements : ");
	int ar[n], i, j;
	for(i=0; i<n; i++) scanf("%d", &ar[i]);
	for(i=0; i<n; i++){
		int min_ind = i;
		for(j=i+1; j<n; j++)
			if(ar[min_ind]>ar[j]) min_ind = j;
		int t = ar[i];
		ar[i] = ar[min_ind];
		ar[min_ind] = t;
	}
	printf("\nsorted :\n");
	for(j=0; j<n; j++) printf("%d ", ar[j]);
	return 0;
}
```

OUTPUT

```
enter the size : 10
enter the elements : 4 5 1 2 8 7 9 10 3 6
sorted :
1 2 3 4 5 6 7 8 9 10
```

RESULT:

Selection sort was executed successfully

BUBBLE SORT

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
int main(){
   int n;
   printf("enter the size: ");
   scanf("%d", &n);
   int ar[n];
   for(int i=0; i<n; i++) scanf("%d", &ar[i]);
   for(int i=0; i<n; i++){
      for(int j=0; j<n-i-1; j++)
         if(ar[j]>ar[j+1]){
            int t = ar[j];
            ar[j] = ar[j+1];
            ar[j+1] = t;
         }
   }
   printf("Sorted: ");
   for(int i=0; i<n; i++) printf("%d ", ar[i]);
   return 0;
}
```

OUTPUT

```
enter the size: 10
enter the elements:
4 5 1 2 8 7 9 10 3 6
Sorted: 1 2 3 4 5 6 7 8 9 10
```

RESULT:

Bubble sort was executed successfully

CIRCULAR QUEUE USING ARRAY

PROGRAM

```
#include<stdio.h>
#include<stdlib.h>
# define max 5
int queue[max];
int front=-1;
int rear=-1;
void enqueue(int element){
   if(front==-1 && rear==-1) {
      front=0;
      rear=0;
      queue[rear]=element;
   }else if((rear+1)%max==front) printf("\nQueue is overflow");
   else {
      rear=(rear+1)%max;
      queue[rear]=element;
   }
}

int dequeue(){
   if((front==-1) && (rear==-1)) printf("\nQueue is underflow");
   else if(front==rear){
      printf("\nThe dequeued element is %d", queue[front]);
      front=-1;
      rear=-1;
   }else{
      printf("\nThe dequeued element is %d", queue[front]);
      front=(front+1)%max;
   }
}
```

```
void display(){
   int i=front;
   if(front==-1 && rear==-1){
      printf("\n Queue is empty");
   }else{
      printf("\nElements in a Queue are :");
      while(i<=rear)  {
         printf("%d,", queue[i]);
         i=(i+1)%max;
      }
   }
}
int main()  {
   int ch=1,x;
   while(!0) {
      printf("\n1.insert 2.delete 3.show 4.exit\nenter your choice: ");
      scanf("%d", &ch);
      switch(ch){
         case 1:
            printf("enter the element: ");
            scanf("%d", &x);
            enqueue(x);
            break;
         case 2:
            dequeue();
            break;
         case 3:
            display();
            break;
         case 4:
            exit(0);
```

```
    }
  }
  return 0;
}
```

OUTPUT

```
1.insert 2.delete 3.show 4.exit
enter your choice: 1
enter the element: 10

1.insert 2.delete 3.show 4.exit
enter your choice: 1
enter the element: 20

1.insert 2.delete 3.show 4.exit
enter your choice: 1
enter the element: 30

1.insert 2.delete 3.show 4.exit
enter your choice: 3
Elements in a Queue are :10,20,30,

1.insert 2.delete 3.show 4.exit
enter your choice: 2
The dequeued element is 10

1.insert 2.delete 3.show 4.exit
enter your choice: 3
Elements in a Queue are :20,30,

1.insert 2.delete 3.show 4.exit
enter your choice: 1
```

enter the element: 40

1.insert 2.delete 3.show 4.exit

enter your choice: 2

The dequeued element is 20

1.insert 2.delete 3.show 4.exit

enter your choice: 2

The dequeued element is 30

1.insert 2.delete 3.show 4.exit

enter your choice: 2

The dequeued element is 40

1.insert 2.delete 3.show 4.exit

enter your choice: 2

Queue is underflow

1.insert 2.delete 3.show 4.exit

enter your choice: 3

Queue is empty

RESULT:

Circular Queue using Array was executed successfully