**LAB NO :09**

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**Section: II**

Question#01:To develop stack using Array(using generic class)

a)Implement the isEmpty() method in the Stack

b)Implement the getSize() method in the Stack

c)Implement the search() method in the Stack to check whether the element exists in thestack or not.

d)Implement the push() method in the Stack and then Push 10 values.

e)Implement the pop() method in the Stack and print the stack using pop.

f)Display the all stack data using display() method..

class StackTASK1{  
 Object stack\_array[];  
 int peek,size;  
 StackTASK1(int size){  
 this.size=size;  
 this.stack\_array= new Object[size];  
 this.peek=-1;}  
  
 void push(Object data){  
 if(isFull())  
 System.*out*.println("Overflow: stack is full");  
 else{  
 stack\_array[++peek]=data;  
 System.*out*.println("Element push "+data);  
 }}  
  
 Object pop(){  
 if(isEmpty()){  
 System.*out*.println("Underflow: stack is empty");  
 return -1;  
 }  
 else{  
 Object val=stack\_array[peek];  
 peek--;  
 return val;  
 }}  
  
 boolean isEmpty(){  
 return (peek<=0);  
 }  
 //isFull method  
 boolean isFull(){  
 return (size-1==peek);  
 }  
  
  
 int search(Object data){  
 if(isEmpty()){  
 System.*out*.println("Stack is empty");  
 return -1;  
 }  
  
 else{  
 for(int i=0; i<stack\_array.length; i++){  
 if(stack\_array[i]==data){  
 return i;  
 }  
 }  
 return -1;  
 }}  
  
 Object peek(){  
 return stack\_array[peek];  
 }  
  
 int getSize(){  
 return size;  
 }  
  
 public void display(StackTASK1 s){  
 for (int i=s.stack\_array.length-1; i>=0;i-- ){  
 System.*out*.print(s.stack\_array[i]+" ");  
 }}  
  
  
}class Lab\_9 {  
 public static void main(String[] args) {  
  
 //TASK 1  
 StackTASK1 s=new StackTASK1(5);  
 s.push(1);  
 s.push(2);  
 s.push(3);  
 s.push(4);  
 s.push(5);  
 s.display(s);  
 System.*out*.println();  
 System.*out*.println(s.pop());  
 System.*out*.println(s.peek());  
 System.*out*.println("size of stack: "+s.getSize());  
 System.*out*.println(s.search(12));  
 System.*out*.println(s.search(3));

}}

**OUTPUT:**

"C:\Program Files\Java\jdk-17.0.2\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\lib\idea\_rt.jar=50971:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\bin" -Dfile.encoding=UTF-8 -classpath C:\Users\hp\IdeaProjects\DSA\_ALL\_LABS\out\production\DSA\_ALL\_LABS Lab\_9  
 Element push 1  
 Element push 2  
 Element push 3  
 Element push 4  
 Element push 5  
 5 4 3 2 1  
 5  
 4  
 size of stack: 5  
 -1  
 2  
  
 Process finished with exit code 0

Question#02:To develop stack using Linked List implemented in the previous lab(using generic class)

a)Implement the isEmpty() method in the Stack

b)Implement the getSize() method in the Stack

c)Implement the search() method in the Stack to check whether the element exists in thestack or not.

d)Implement the push() method in the Stack and then Push 10 values.

e)Implement the pop() method in the Stack and print the stack using pop.

f)Display the all stack data using display() method

. class StackTASK1{

StackTASK2 s=new StackTASK2();  
 s.push(101);  
 s.push(201);  
 s.push(300);  
 s.push(42);  
 s.push(505);  
 s.display();  
 System.*out*.println();  
 System.*out*.println(s.pop());  
 System.*out*.println(s.peek());  
 System.*out*.println("size of stack: "+s.getSize());  
 System.*out*.println(s.search(2001));  
}  
 }

class StackTASK2{  
 //node class  
 static class stackNode{  
 //properties of node class  
 Object data;  
 stackNode nextNode;  
 stackNode(Object data){  
 this.data=data;  
 nextNode=null;  
 }}  
  
  
 int size;  
 stackNode peek; //head  
 //constructor of stack class  
 StackTASK2(){  
 peek=null;  
 size=0;}  
 boolean isEmpty(){  
 return (peek==null);  
 }  
  
  
 void push(Object data){  
 //create new node  
 stackNode newNode=new stackNode(data);  
 if(isEmpty()){  
 peek=newNode;  
 }  
 else{  
 newNode.nextNode=peek;  
 peek=newNode;  
 }  
 size++;  
 }  
  
  
  
 Object pop(){  
 if(isEmpty()){  
 System.*out*.println("Underflow: stack is empty");  
 return -1;  
 }  
 else{  
 stackNode tempNode=peek;  
 peek=tempNode.nextNode;  
 tempNode.nextNode=null;  
 stackNode deletedNode=tempNode;  
 size--;  
 return deletedNode.data;  
 // System.out.println(head.data+" is deleted.");  
 }}  
  
  
 Object peek(){  
 return peek.data;  
 }  
  
  
 boolean search(Object data){  
 boolean flag=false;  
 stackNode tempNode =peek;  
  
 while(tempNode!=null){  
 if(tempNode.data==data){  
 flag=true;  
 } else  
 tempNode=tempNode.nextNode;  
 }  
 return flag;  
 }  
  
  
 public void display(){  
 stackNode tempNode=peek;  
 //for(i=1; to size)  
 //while(tempNode!=null)  
 while(tempNode!=null){  
 System.*out*.print(tempNode.data+" ");  
 tempNode=tempNode.nextNode;  
 }}  
  
 public int getSize(){  
 return size;  
 }  
}

**OUTPUT:**

"C:\Program Files\Java\jdk-17.0.2\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\lib\idea\_rt.jar=50977:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\bin" -Dfile.encoding=UTF-8 -classpath C:\Users\hp\IdeaProjects\DSA\_ALL\_LABS\out\production\DSA\_ALL\_LABS Lab\_9  
 505 42 300 201 101  
 505  
 42  
 size of stack: 4  
 false  
  
 Process finished with exit code 0

**TASK NO:3**

Question#03:Implement the forwardand backwardfeature in web browsersusing stack.(Useeither array or linked list it isyour choice)

interface Stack {  
 public Object peek() ;  
 public Object pop();  
  
 public void push(Object obj);  
 public int size();  
}  
class ArrayStack implements Stack {  
 private Object []a;  
 private int size;  
  
 public ArrayStack(int cap){  
 a = new Object[cap];  
 size=0;  
 }  
 public boolean empty(){  
 return size==0;  
 }  
  
 public String toString(){  
 StringBuilder str = new StringBuilder(String.*valueOf*(this.a[size-1]));  
 for(int i=size-2;i>0;i--)  
 str.append(", ").append(String.*valueOf*(this.a[i]));  
 return "["+str+"]";  
  
 }  
  
  
 public Object popLast(){  
 Object obj= a[0];  
 a[0]=null;  
 System.*arraycopy*(a,1,a,0,--size);  
 return obj;  
 }  
  
 public boolean isEqual(ArrayStack s){  
 if(this.size==s.size) return false;  
 for (int i=0;i<s.size;i++) {  
 if (!this.a[i].equals(s.a[i])) return false;  
 }  
 return true;  
 }  
  
 @Override  
 public Object pop() {  
 if(empty()) throw new IllegalStateException();  
 Object obj=a[--size];  
 a[size]=null;  
 return obj;  
 }  
  
 @Override  
 public Object peek() {  
 if(empty()) throw new IllegalStateException();  
 return a[size-1];  
 }  
  
 @Override  
 public int size() {  
 return 0;  
 }  
 public int clear() {  
 return 0;  
 }  
  
 @Override  
 public void push(Object obj ) {  
 if(size==a.length) resize();  
 a[size++]=obj;  
 }  
 private void resize(){  
 Object []aa=a;  
 a= new Object[2\* aa.length];  
 System.*arraycopy*(aa,0,a,0,size);  
 }  
 public void print(){  
 System.*out*.println("This is the whole stack ");  
 for(int i=this.size-1;i>0;i--){  
 System.*out*.print(this.a[i]);  
 System.*out*.println();  
 }  
 }  
  
}

class Lab\_9 {  
  
 static ArrayStack *backStack* = new ArrayStack(3);  
 static ArrayStack *forwardStack* = new ArrayStack(3);  
  
 private static Object back() {  
 if (*backStack*.empty()) {  
 return null;  
 }  
 *forwardStack*.push(*backStack*.pop());  
 if (*backStack*.empty()) {  
 return null;  
 }  
 return *backStack*.peek();  
 }  
 private static Object forward() {  
 if (*forwardStack*.empty()) {  
 return null;  
 }  
 *backStack*.push(*forwardStack*.peek());  
 return *forwardStack*.pop();  
 }  
 private static void browse(String a) {  
 if (!*forwardStack*.empty()) {  
 *forwardStack*.clear();  
 }  
 *backStack*.push(a);  
 }  
  
  
  
  
 public static void main(String[] args) {

*browse*("ur1");  
 *browse*("url2");  
 *browse*("url3");  
 System.*out*.println(*back*());  
 System.*out*.println(*back*());  
 *browse*("url4");  
 System.*out*.println(*back*());  
 System.*out*.println(*forward*());  
 System.*out*.println(*forward*());  
 System.*out*.println(*forward*());  
 // System.out.println(forward());  
  
}  
 }

**OUTPUT:**

"C:\Program Files\Java\jdk-17.0.2\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\lib\idea\_rt.jar=51212:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2022.1\bin" -Dfile.encoding=UTF-8 -classpath C:\Users\hp\IdeaProjects\DSA\_ALL\_LABS\out\production\DSA\_ALL\_LABS Lab\_9  
 url2  
 ur1  
 ur1  
 url4  
 url2  
 url3  
  
 Process finished with exit code 0