Question 01 (25 marks)

a)

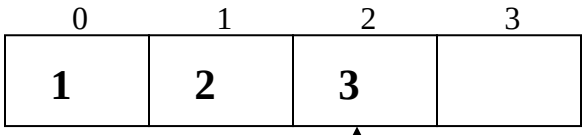
i. What are abstract data structures? (2 marks)

ii. Give two examples of abstract data structures. (2 marks)

b) A frameset of a stack (created using an array) is given below.

Draw sequence of **frames** when you apply the operations given below on this stack. (8 marks)

Clearly indicate the steps followed.

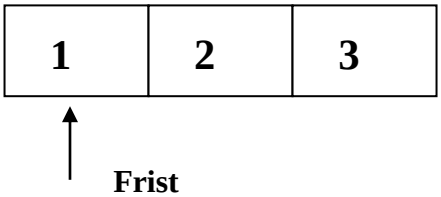


1) push(4)
2) pop()
3) push(pop())
4) push(pop())
5) peek()
6) pop()
7) peek()
8) push(4)

c) A frameset of a stack (created using a linked list) is given below.

What will be the **final frame** set when you apply the operations given below on this stack? (8 marks)

Clearly indicate the steps followed.



1) push(4)
2) pop()
3) push(pop())
4) push(pop())
5) peek()
6) pop()
7) peek()
8) push(4)

d) It is required to give the top element and pop a value from a stack under the linked list implementation of stack using the following steps. (3 marks)

A. {
B. }
C. return firstItem ;
D. if (isempty ( ))
E. Link firstItem = frontOfQueue.element ;
F. frontOfQueue = frontOfQueue.next ;
G. return null ;
H. public link pop( )

What is the correct order of the routine?

e) Write a method to clear a stack. (2 marks)

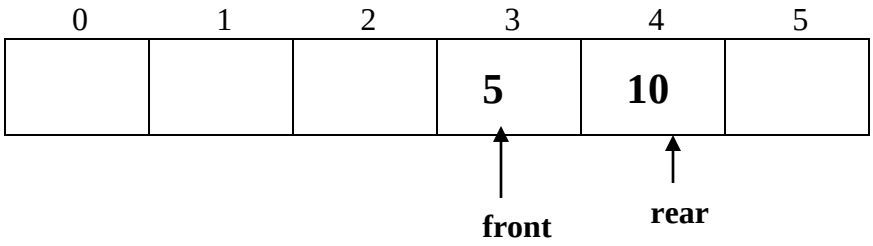
public void clearStack()

Question 02 (25 marks)

a) A frameset of a **circular queue** (created using an array) is given below.

What will be the **final frame** set when you apply the operations given below on this queue? (6 marks)

Clearly indicate the steps followed.

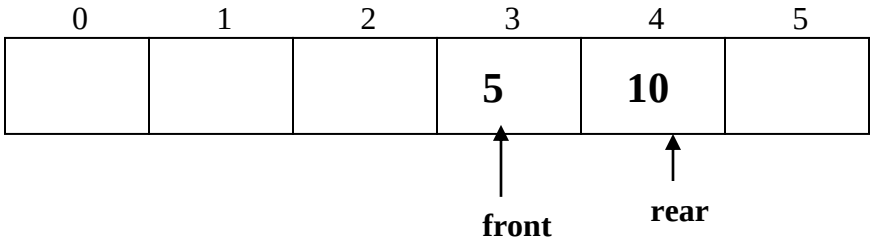


1) insert(4)
2) insert(5)
3) peek
4) remove()
5) peek()
6) insert(8)

b) A frameset of a **linear queue** (created using an array) is given below.

What will be the **final frame** set when you apply the operations given below on this queue? (6 marks)

Clearly indicate the steps followed.

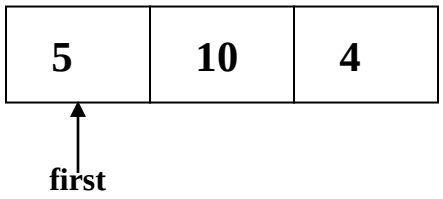


1) insert(4)
2) insert(5)
3) peek
4) remove()
5) peek()
6) insert(8)

c) A frameset of a **queue (created based on a linked list)** is given below.

What will be the **final frame** set when you apply the operations given below on this queue? (3 marks)

Clearly indicate the steps followed.



1) insert(4)
2) insert(5)
3) peek
4) remove()
5) peek()
6) insert(8)

d) A CirculerQueue class contains the following properties. (10 marks)

```
int maxSize;
int queArray[];
int front;
int  rear;
int  nItems;
```

Complete the dequeue (Remove) method for the CirculerQueue class.

```
public int dequeue()
{




}
```

Question 03 (25 marks)

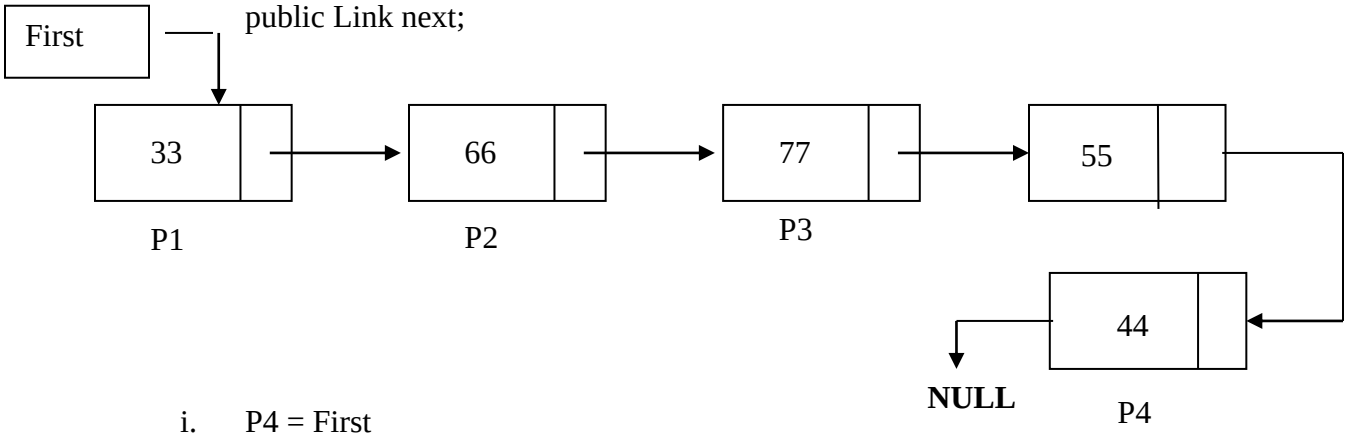
a) You are given the following **LinkedList** of Link objects and variables P1, P2, P3 and P4 which refers each link. For each code segment, draw a similar figure indicating how the list changes.

(12 marks)

Code segments are executed independently.

Link class has following properties

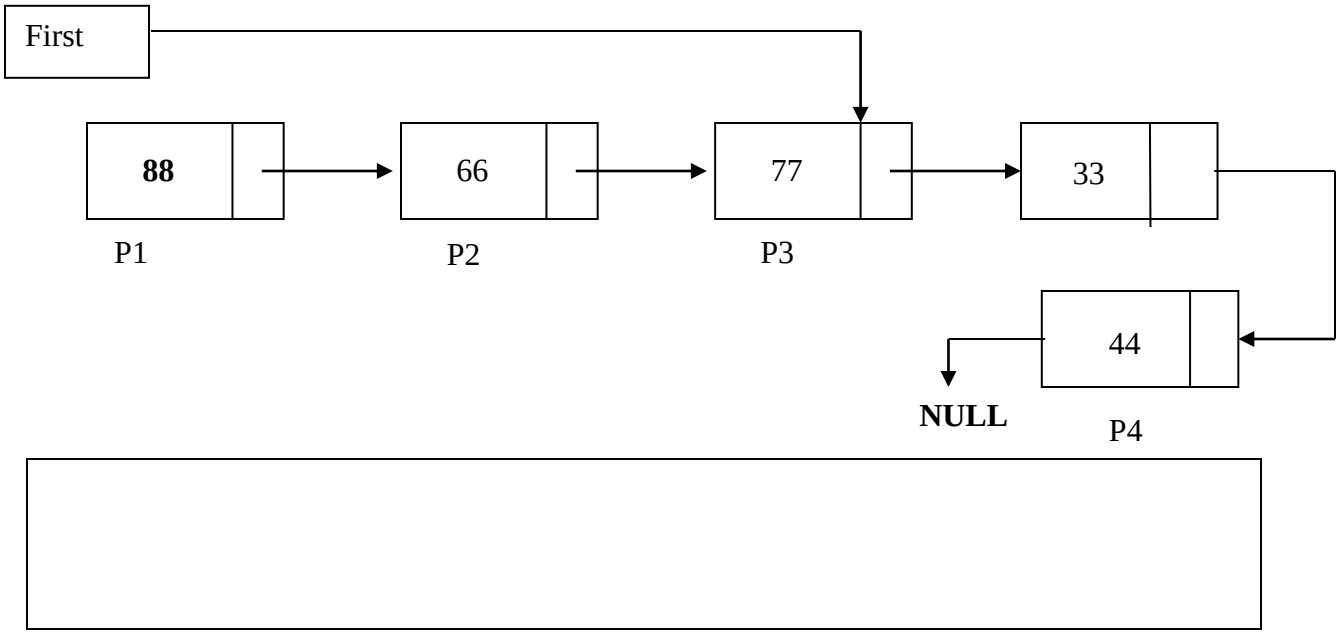
public int data;
public Link next;



i. P4 = First

ii. P3.next.data = P1.data;

iii. What code segment(s) to be executed to generate the linked list given below.



b) Write a method to update the value stored in the LinkedList class explained in Part (a). Method would accept the old value and the new value. It should return true if it is successful and false otherwise. (8 marks)

```
public boolean update(int oldVal, int newVal)
{




}
```

c) Write a method to LinkedList class to display all the link details. (5 marks)
Link class has following properties
public int data;
public Link next;

```
public void display()
{




}
```

Question 04 (25 marks)

a) Consider the code given below.

```
1.void bubbleSort (double  array[], int size) {
2.      double temp ;
3.      for (int pass = 1; pass < size; pass++)
4.         for (int i = 0; i < size – pass; i++)
5.             if (array [i] > array [i+1])
6.             {
7.                  temp = array[i] ;
8.                  array[i] = array [i+1] ;
9.                  array [i+1] = temp ;
10.                    }
11.    }
```

i) Specify the importance of the bolded code segment given in line 4.
(2 marks)

ii) Specify the importance of the bolded code segment given in line 7 to 9.
(2 marks)

b) How many numbers will a **linear search** check before it finds that **22 is in** this array?
(2 marks)

0	1	2	3	4
99	**11**	**55**	**22**	**11**

c) What will the following array look like after one pass of descending order bubble sort algorithm (just before the second pass)? (5 marks)
Clearly indicate the steps followed.

0	1	2	3	4
55	**88**	**22**	**55**	**77**

d) Show all the steps on how you would sort the array given below in ascending order using Selection Sort. (10 marks)

0	1	2	3	4
88	**77**	**11**	**55**	**55**

e) After sorting the array given in part d, how many numbers the binary search will check before it finds that 77 is in this array? Clearly indicate the steps followed.

(4 marks)

End of the Question Paper