

LABORATORY WORK BOOK

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			MARKS AWARDED						
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Signature of the Faculty

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nim: The circular linked list is a linked list where all the nodes are connected to form a chacle. In a circular clinked list, the tionstowde & lattowde are connected to eachother which forms a chole- There is no NULL at the end. Code: class Node & int data: Mode next: Mode (Port data) § this data = data; this next = null; Class Circula, Linkedlist & perivate Node head = null; private Node tail = null; public void insutat Beginning (int data) { Node new Node = new Node (dala); if (head == null) { head = new Mode; fail = new Node; tail-next = head; I clac & incurred . next = head; -lail-neat = newalode: head = new Mode;

```
ROLL IVE
     public void insert At End (intidada) ?
        Node new Node = new Mode (data);
       HChead == null) {
          head = newNode;
          tail = new Mode;
                                       şınlı<sup>r</sup>nő.
          tailment = head;
      Jelse &
                                populsi protiti
         tail-neat = new Node;
                                 garane haris
         new Mode next = head;
                                   - Januar Hillian
         tail = new Node;
                             there bout - had
  public void insertation (intapter Data, int dates) {
     Node current = head;
        if (current. data == ajtor Data) {
     do 3
           Node new Mode (data);
           new Mode. next = current. next;
          current next = new Mode;
                            A Children Carl
          9f (current == tail) 9
            tail = newalode;
                                 a Hilli to know
```

oretuen;

current = current. nent;

} while (corrent! = head);

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System. out. print. In ("Node with data" + afterdates 4" not pounds.
 public void deletentBeginning() {
     It (head == null) §
       System. out. porint lo(" list is emply.");
       outun:
    Pt (head = stall) $
                           relative a figuration
       head = null;
                          Her I top other
       tail = null;
                              ; shubrusar: Wel
   4 else &
      head = head next;
    tail-next = head; is his month from his silver
                             High reports + Hight;
public void deleteAtEnac) {
                           it crussint data * i
    It Chead == null) &
      System. out-printen ("List is empty-").
      ordun; im describe ton shot un
                    CALLERY & JASH STREET OF THE PROPERTY OF
   if Chead ==teui) & [ ( in the many )
      head = null;
                         indiana ma
      tail = nul
  Jelse &
    Node current = head;
    While (current. nent!=tail) ?
          Current nent;
```

```
current next " head;
      tall = current;
 public void deuter-ster (not extendata) q
    Node current = head;
       if (current data = capturbata)?
   do f
         if (current. next e = head) ?
           System. oct. ponnt.en ("No node to delile"-1 afferbala);
           outurn:
                                curent-nent = current-nent-nent;
        it (current-next == head) 2
           tail = current; in the handle have
         riction; all matured ") " Library
      current = current-nent;
  I while (current ! = head);
                                      + after Data -1" not found.");
 System. out. portent ("Node with data"
                       and a reliable of the
public void Fravouse() }
   ft Chead = = null) §
      System. out. porntln ("List is empty.");
      retur;
```

```
Made current = head;
      d0 9
          System. out-point (corrent. data + " ");
          cussent = cussent - nent;
      I while (current ! = head);
     System.out. polintin();
                 public class Circulou Linked-List &
   public Static void main (String[] airgs). }
      Circularlintedlist C11 = new Circularlintedlist();
      CL1. Insert At Beginning City;
      CLI. ProsetAt Beginning (5);
     CUl. insut-At End (20);
     C11- Prosentatend (25);
                          The British & Self
     C11. ProcetAtter(10,15);
     System. Out-point do ("Circular List after Poscations:");
    C11. traveruecy
                          CERTICATION OF ELECTRICAL
    Cl1 - deletat Beginninges;
    Cols. delete At Ender:
                               Landerford Lander
   C11. dulite Atta(10):
   System. out portutal Circular list after deletions: ");
   chi. traversecs.
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Cigling:
 character whole the efter headlens : 10 10 10
 Moutan Inter list refler deletions ; 1000.
Affect of doubly thered there is a type of thotal till to
which each rede consists of point, date and next.
codet

    16 (1) 1.34

clau Node f
                          أحدرت فلانطا ويحطون أمادو
   int data;
   Node POICE;
                              MINUTAL STATE
   Node nent;
                              j Maji na pravajaja <u>spisal</u>itas 19
   Node (Int data) ?
                                  this datas data:
       this poer = mull;
                            with this post for the wish of
       this next = will;
                               · marky - Harrier W. A.
                            F Comment of Delivering of the
  4
class Roubiglinkedlist &
   ponvate Node head a hull; filled the targette
           Nede tall a mill:
   policite
   public void insert Al Begging Cipt etala) ?
      Node new Nade a new Mode Edate);
     Albead = rull) ?
         head = tall = new Mode:
     felse &
```

```
newHoole ment sheads
    head-poier a newslode;
    head a new Node; in the majorismi richer
public vota insulateral Cint data) ?
   Node newNode = new Node Colados;
   ff (tail == null) 9
     head = tail = new Node;
  Jelse &
     tail-neat = new Mode;
     new Mode · porev = tail;
    tail = new Node;
public void insert Atter (int after Date, int date) ;
  Node current = head!
  while (current! = head && arrent-data! = afterData)!
    current = current. nent;
 it Courrent == null) }
   System.out.porntln("Node with data");
  ordung
 Node rewnode = new Node Colata;
 revolude. nent = cussent. nent;
 newNode . porev = CHOTEN;
 et (current. next 1 = null) q
```

```
current peal poier a new Nocle;
 I clac ?
    -louil = new Mode;
  cullent next = new Nocle;
public void deletent Beginninges ?
   il Chead == hull) q
     System. out. pointen ("List is Emply.");
    ordun;
   it Chead = = (ail) &
     head stail = null;
                                  A nata d
  } else {
                  - Laborer of Spagner.
     head a head nent;
     head . poier = null;
public void deletentendes {
    St (tail == null) {
     System-out-portal/ (11st is Empty.");
     oretun;
   it (head == tail) {
     head tail = nul;
  3 else q
     tail stail poreve.
     tail nent = nui
```

```
public void deluteNode (Int data) &
ROLL NUMBER :
      while Coursent! = null & & current data! = doots) ?
         current = current. neat;
        System. out. point in ("Node with data" + data 1" not ly
      it Courrent == null) }
        outcun!
     I it (curent = = head) {
         deliteAt Beginning();
     I close of (coment = = tous) }
        deleteAtEnd();
                         Eller + Tiple broke
    Je else &
        current. porevo nent = current-nent;
       current. nent. porev = current. porev;
  public void travoue forwards &
     if Chead == null) &
        System-out-parintln(" list is Empty.");
        oretuin;
     Node current = head;
     While Courrent! = null) &
        System.out. pount (current odata!" ");
        convent = convent. nent;
     System. ad. polintunco;
```

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```
public void travoise Backward() ?
      it (tail = = null) &
      . System. out. porinten (" list is (mpty.");
                 والكال والكالم الكالم المراكدة والمواجع المناه والمتعاولة والمتعاولة والمتعاولة والمتعاولة والمتعاولة والمتعاولة
        oretun;
      Node current e tail;
System out-pornt courrent datas" ";
   2 Cussent = cursent. porev;
      System-out-printing;
                                       P alook mitt
public class Doubly-linked-list &
    public static void moun (string[] digs) &
       PoulslylPnkedlist all = new Doubly linkedlist();
       dl1. Pinsest At Beginning (10; 15);
       dla. Prosentatend (20,25);
      dl. insert After (10,15).
       dll. Traverue farword();
      dt1. Traverse Backward():
      d11. allte Node (187;
      System-out poraling Doubly 19st (forward Traversal);");
     System out printer l'inted list After deletions (Forward
                 Traveral: ")
                              A. m. Agay
```

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county the ed true forward Toward State and 15 10 15 20 25,
                Chesty threatist (Bothward Tooversal): 25 20 15 105
                Doubly Minted 11st Apren deletion (Forward Traversal): 10
               Doubly threed 1951 - Apro deletion Backward Traversal): 20 16
8-3 fine: Other two souled country circular dinted list the
                arrhaning ni & nz nodes onespectively. The paoblemus
                merge the two lists such that presultant list is also
                                                                                                                and the state of the second state of the secon
                Sooded coda.
               Code:
                class Node ?
                                                                                                                                        of an heart was a file
                              int data;
                             Node next;
                              Node prev;
                              Mode (int data) & a many whole was the
                                           this data = data;
                                           this prev = null; you want have a feet
                                           this next = null; _ if it is a property and a sure of the best of
                 Class Doubly Circular Society &
                            public void insertationalint datas &
                                         Node newslade : new Node (data);
                                        if (head = null) &
                                                head = new Node;
```

```
head-next= head;
  head poier = head;
                            The other
  3 else &
    Noch last = head polev;
   last nent = new Ngole;
   new Node. porev = last;
   new Node next = head; Tilder in heart should be
                          The Wholl much
   head poier = new Node;
to Zatrani pigle martin gluppi top in at planer at all at all de la comition.
 public void displayes &
    it Chead == null) &
      System. aut. porntun(" List is Empty.");
                      ing 123 non a separation that
      outurn;
                 hata i classed o ou mbado i tuels di M
    Node current = head;
                     fortune of a department
      System. out-posint Coursent date to the si
    do s
      current = current. next;
                                    Predict F
   3 while Coursent; = heads; classification
   System.out.polintan();
 public Static Node Mergelists (Node head)
   AChead == null) return head 2;
   itChead2 == nul) return head1;
   Node Last = head 1. porev;
```

```
Node dat2 = head2 · poiev;
              Node dast Node : Clast 1. data 2 dast 2. data) ? Last 2: Last.
             lastinent = null;
             late nent = rull;
            Node tinal Head = merge souted Doubly ListsChead , heads,
           finalHead. porev = last Node;
            lastNode-nexts-finalHead;
                                                                        . Agreement of the second of the second
            rction final Head;
 perivate static Node mergesanted Doubly 1854 (Mode head), Node
                                                                                       a countrie to the states
        Node dummy = new Node(0);
        Noac tail = dummys ford my lar - mount
        While Cheady = null & & head 2! = null) {
                                                                                                                   mutak
                 it (head 1. data < = head 2. data) {
                     tailinent = headl; itand = traceus story
                      head . porev = tail;
                      head = head - next; hory his maly
                                                                  current a consent rept;
               } else $
                     tail-nent = heads; promise personal with f
                      heads. parcy aterity commission in the
2 Person of the state of the st
                      heads = heads-next;
              tail = tail-nent; his his wife contain ( 1000 d) H
    At Chead 1 = null) &
          tail-neat = head;
```

```
ROLL NUMBER .
       heads poier = toil;
     Pt(heads 1 = null) }
      tail heat = heads;
                                     r o to all march
      headz-porev = -toil;
    Node mergedtlead = dummy-nemt;
    It (mergedtlead!= null) {
       merged Head . pover = nell;
                                               rould neith
   ordun mergedtlead;
                                      COME THE WALLES
   Public Static Void moun (String [] args) &
public clas Mergersonted Doubly C12 {
      Doubly Circular Linkedlist Listi = new Doubly C12C2;
      Doubly Circular linked List 196+2 = neur Doubly CL4();
     lists insextatendo;
     dista. InsertAtend(3);
     System. out porinten ("List 1: ");
    list. displayer;
                        est mate that the heat their
    # Similarly List 2
    Node merged-Head = Doubly Circular inted List. mergelists
                                    : Clisti-head, list2-head).
    System-out-portation " Merged list: ");
                                      lub - s koscio iri.
    mugedlist-alisplayer;
```

```
Output:
   List1: 135
   List 2: 2 4 6
  Merged List: 1 2 3 4 5 6.
Aim: Given a doubly inted ust and a key on the posoblem is
to delete all occuences of given key a from the doubly
Linked List.
Code:
clan Mode f
    ant data:
    Node next, prev;
     Node (int data) {
       this data = data;
        this pent = null;
       this. prer = null;
                                 kind one admir
                             PERFER LANGE WAS CAR.
public class Deut Node AtGiven Position &
   Static Mode deleter Mode (Mode head, Node del) &
     · If (del == null) {
                          the theory product of the
         detun head;
     1+ Chead == del) §
        head = del-nent;
```

```
OLL NUMBER :
      11 Codel poier 1 = null) $
        del-poier. nent = del-nent;
     if Call rent = nill) $
       del-next-poier = del-poier;
     del a null;
                            habers base should white:
     oretun head;
  State Node deleterlodeAGivenPos(Node head, int n) ?
     1+ (head == null 11 DC=0). }
       ordun head;
                    a boot - range - brown - bring - bread
     Node current = head;
    for (Port 1=1; 92 n & & convent!= null; 9++) }
       current=current-next;
                      e. Jackson Sardelle Paris zu der Son Ausstelle
    System-out-pointen ("position
       oreturn head;
                                  head = delete Node Chead, current);
    oretun head;
                                              THE PARK
 Static void paratiest (Node head) &
 E
     it Chead == null) §
        System-out-pointin("il9st is empty");
        oretuen;
```

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```
& Siena se sente Lary
     Node current = head;
     while (current 1 = null) &
       System. out. porint (current-data + " ");
    System.out. point. (1);
 public Static void main (String [] augs)
    Node head = new Node(1);
    head-nent = new Node(2);
    head next power = head;
    head-nent-nent = new Node (3);
    head-next-next-porev= head-next;
    head next-next: next = new Mode(4);
    head nent-nent-nent-poier = head-nent-nent;
   head-nent-nent-nent-nent = new Mode(s):
   head next-next-next-next-prevs head next-next-next;
   System.out.pointun("original list: ");
   polintlist(head);
                              وبرادعط المطائن
J.
Output:
 original list: 12345 1.
 List After deleting node at position 2: 13 45-
                            11年,李林子中 战争
```

高度於11万度**,**

```
Aim: Eliven a doubly United List and a position no the
tack is to delite the node at the given position of
                                       gir ya sanahiri
 from the beginning.
code:
                                 to an in pagitals of the
Class Node &
                                    والأصاد الأميرون والإندو
    int data;
    Node nent, prev;
                                 physical Day
    Node (int data) {
         this data = data;
        this next = null;
                                  stratu testirali
        this power = null;
                                       قفائسا عار مرجع
public class Delite Occurence In Doubly linked List &
    Static Node deletenode (Node head, Node del Node) {
        if Chead = = del Node) &
           head = del Node - nent;
       if Counode nent != null) {
          del Mode nent. porer = del Mode. porer,
                 while lawrent bird , heren in . I. .
       of (del Node- Polev , = Pull) &
          del Node - priet-pent = del Mode . Dent.
      del Node = null;
                               contract for an other processing
      rotun head:
```

```
State Node deliten work of Abde head, int as &
     PI (hende = nall) $
       " when nell;
    Node current = head;
    while Coursent = null) &
       Node new a conventinent;
       H Courrent data = 2) }
        head & deleterlode Chead, currents;
                            that hery to the
       Current = next;
    return head;
static void popintiist ( Node head) &
    It Chead == null) §
       System-out-potintun ("List 95 Empty-");
       oretun:
                     a fales soloristata a dosa A
    Node current = head;
   whole Coursent! = null) &
      System-out-print (current.data + " ").
      current acursent. nent;
    System out porinting;
public Static void main (string augs (7) }
```

```
Mode head = new Moderno;
      head next = new Nodecis;
      head-neut. preva head;
     head next . next = new Hodeling;
     head-nent-nent-prev = head-nent;
     head-neat-next = neconoclers;
     head next next next prev = head next next ;
    head-next-next-next-next = new Mode (1);
    head-next-next-next-next-prevahead-next-next-next;
    head-neat-neat-neut-neut-neut = new Mode(2);
   System.out.pointIn("original list: ");
   perintist(head);
  int or = 2;
   head = delete Alloccus Of x (head, a);
  System-out printing "List afterdeleting all occurrences of"+2+":";
  printlist(head);
Original List: 2210 84252
Output:
List after deleting au occurences of 2:10 8 45.
```

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