

GLS UNIVERSITY

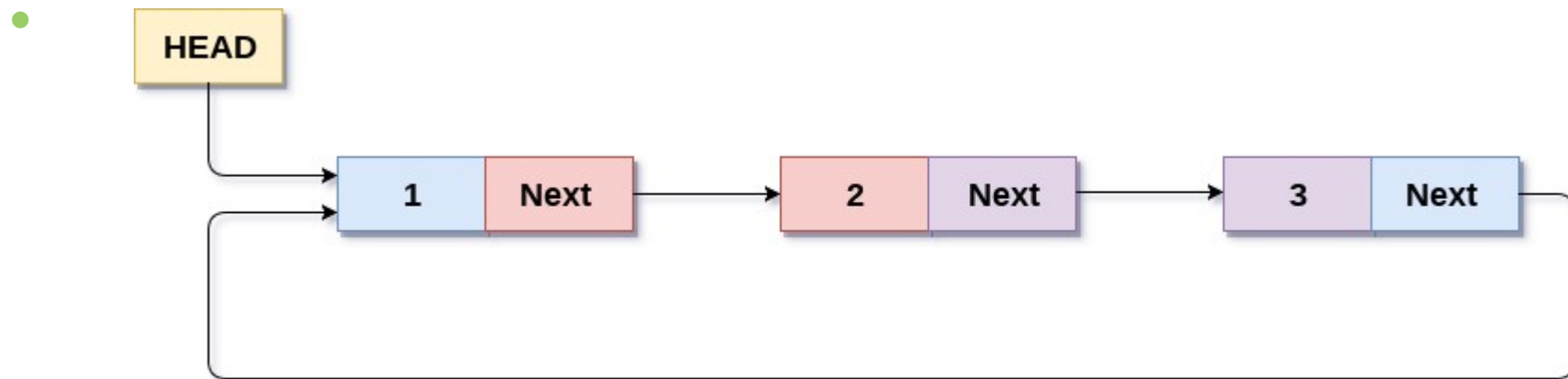
DATA STRUCTURES.
UNIT– II

Circular Linked List (CLL)

- In a circular linked list, the last node contains a pointer to the first node of the list.
- CLL is a linked list where all nodes are connected to form circle. There is no NULL at the end.
- A Circular linked list can be a singly circular linked list or doubly circular linked list.

Circular Singly Linked List (CLL)

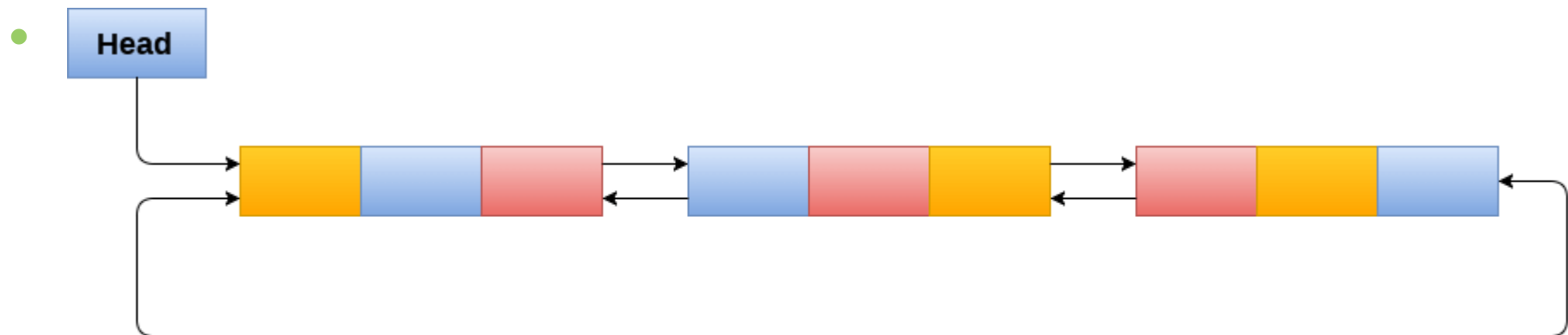
- In singly linked list, the next pointer of the last node points to the first node.



Circular Singly Linked List

Circular Doubly Linked List (CLL)

- In doubly linked list, the next pointer of the last node points to the first node and the previous pointer of the first node points to the last node making the circular in both directions.



Circular Doubly Linked List

Circular Linked List (CLL)

Advantages:

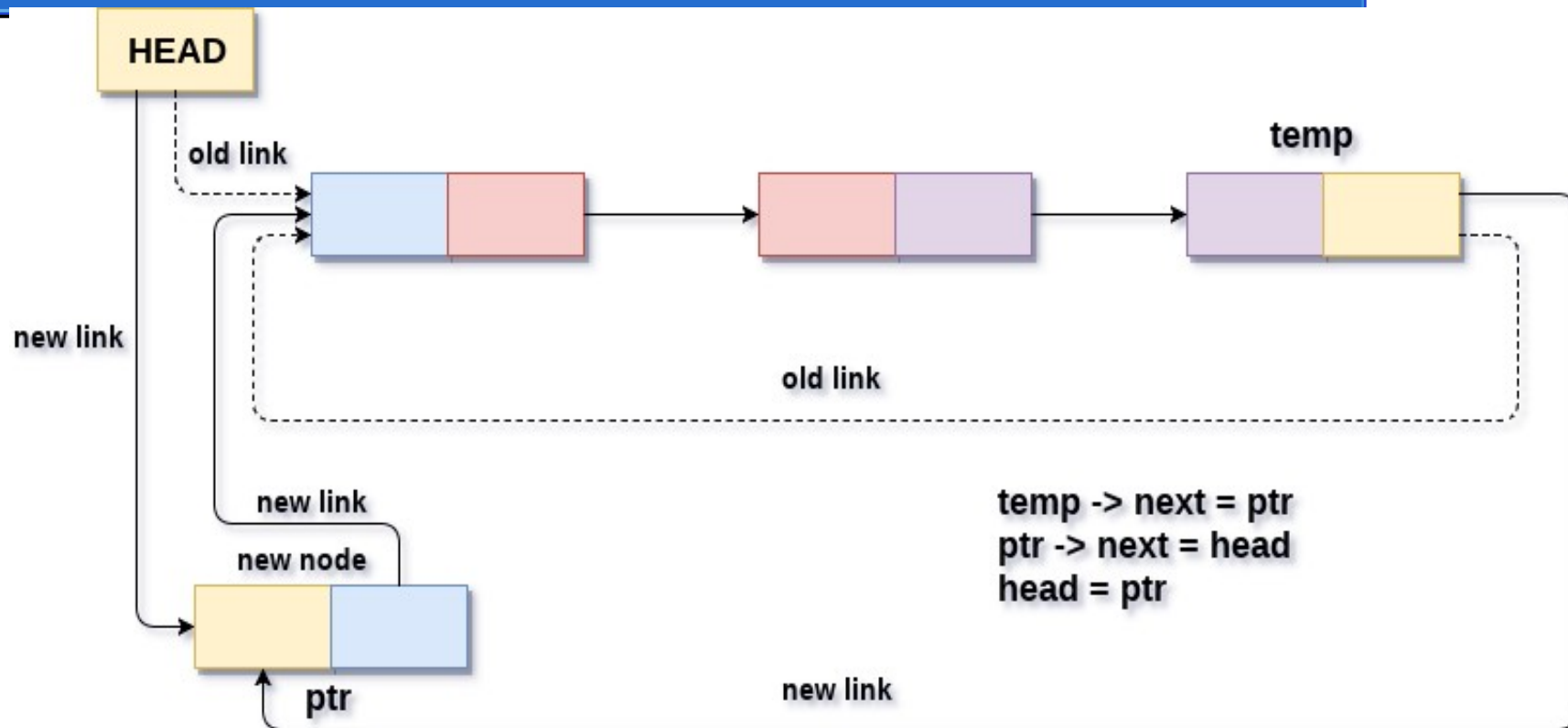
- Any node can be a starting point. We can traverse the whole list by starting from any point. We just need to stop when the first visited node is visited again.
- Useful for the implementation of queue.

Insertion in Singly Circular Linked List

A node can be added in three ways

- 1) At the front of the linked list
- 2) After a given node.
- 3) At the end of the linked list.

Insert a node at beginning in Singly Circular Linked List



Insertion into circular singly linked list at beginning

Insert a node at beginning in Singly Circular Linked List

Step1: SET New_Node = AVAIL

Step2: SET New_Node -> DATA = VAL

Step3: SET PTR = START

Step4: Repeat Step 5 while PTR->NEXT != START

Step 5: PTR= PTR -> NEXT

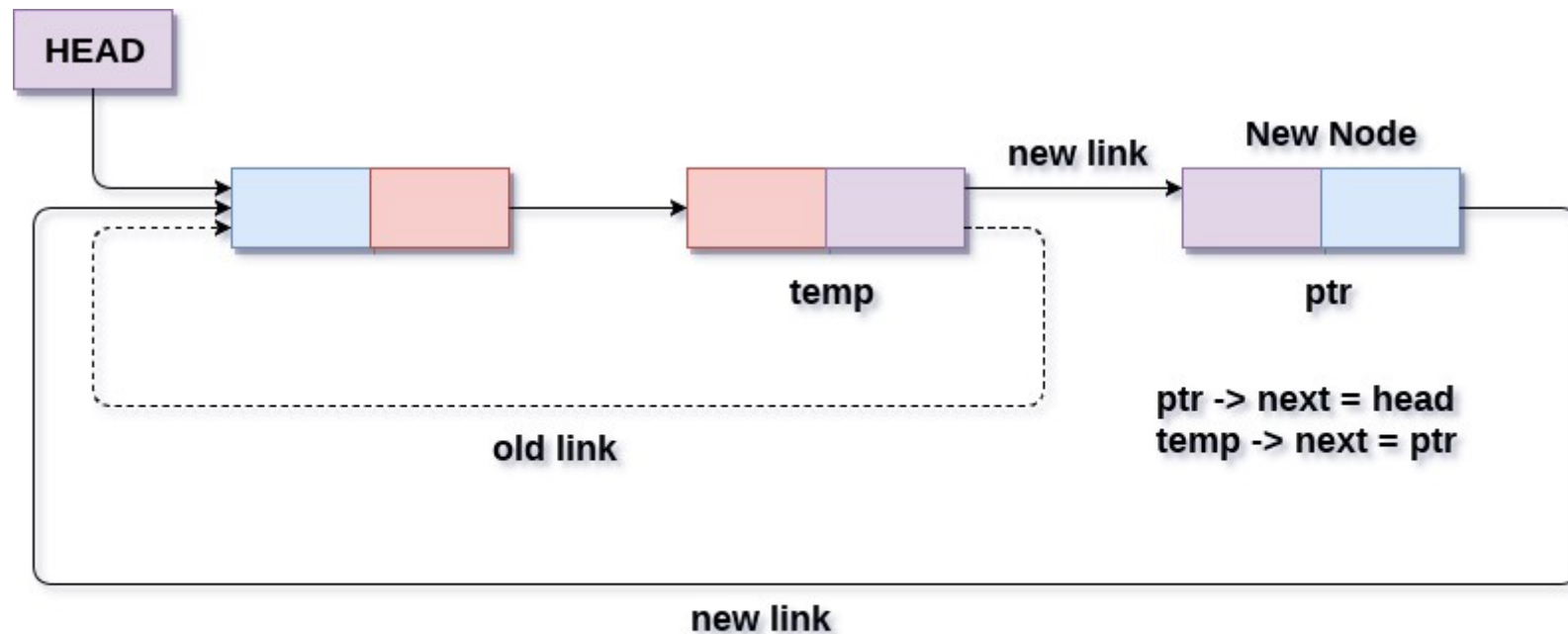
Step 6: SET New_Node -> NEXT = START

Step 7: SET PTR -> NEXT = New_Node

Step8: SET START = New_Node

Step9: EXIT

Insert a node at end in Singly Circular Linked List



Insertion into circular singly linked list at end

Insert a node at end in Singly Circular Linked List

Step1: SET New_Node = AVAIL

Step2: SET New_Node -> DATA = VAL

Step3: SET New_Node -> Next = START

Step4: SET PTR = START

Step5: Repeat Step 6 while PTR->NEXT != START

Step 6: PTR= PTR -> NEXT

[END OF LOOP

Step 7: SET PTR -> NEXT = New_Node

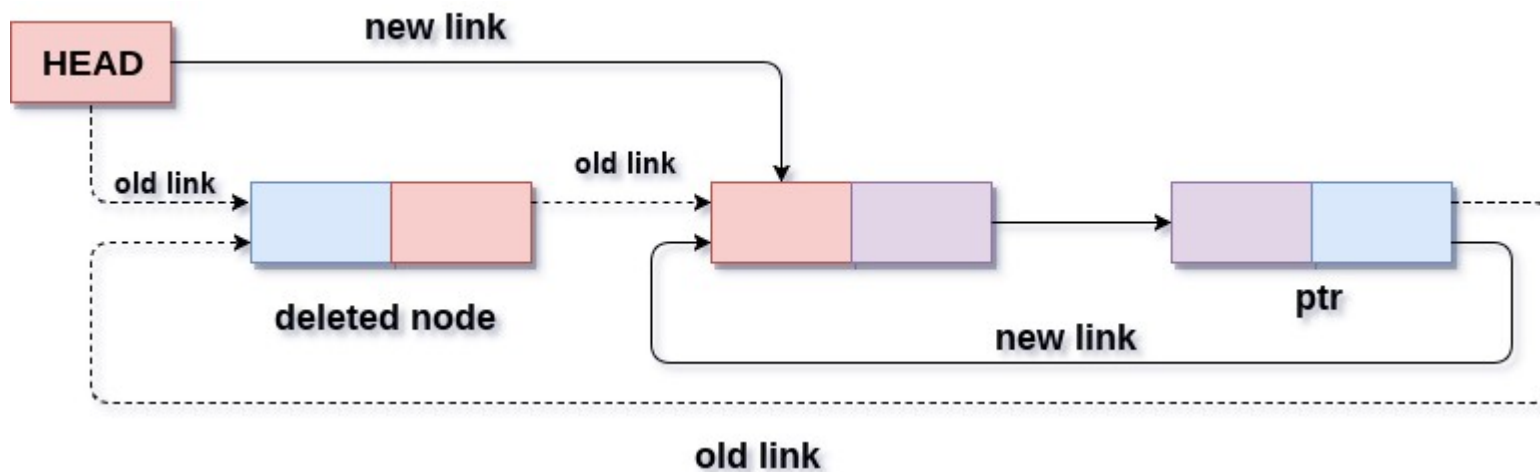
Step8: EXIT

Deleting a node in Singly Circular linked list

A node can be deleted in three ways

- 1) The first node is deleted
- 2) The last node is deleted
- 3) The node after a given node is deleted.

Delete the first node in the Singly Circular linked list



Deletion in circular singly linked list at beginning

Delete the first node in the linked list

Step1: IF START = NULL then

Write UNDERFLOW

Goto Step8

[END OF IF]

Step2: SET PTR = START

Step3: Repeat Step 4 while PTR -> NEXT != START

Step4: SET PTR = PTR -> NEXT

[END OF LOOP]

Step5: SET PTR -> NEXT = START-> NEXT

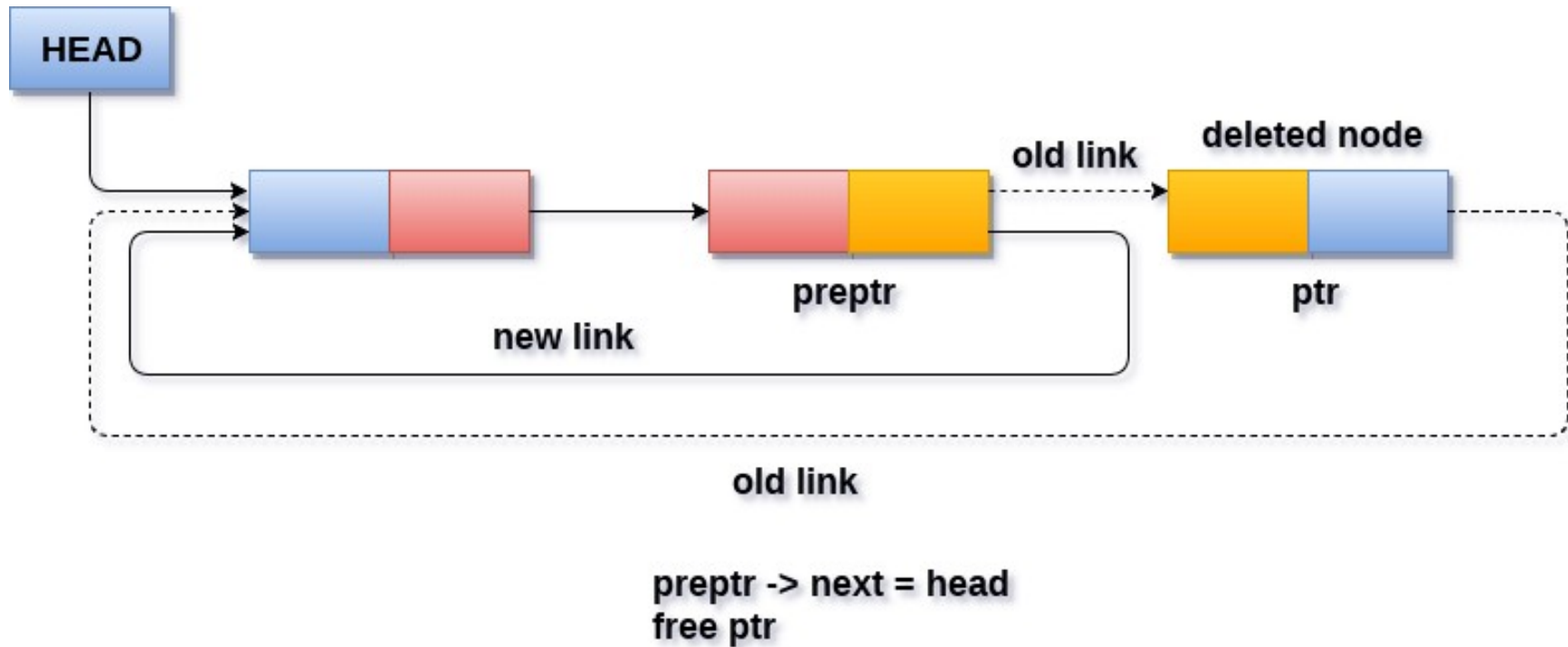
Delete the first node in the linked list

Step6: FREE START

Step7: SET START = PTR -> NEXT

Step8: EXIT

Delete the Last node in the Singly Circular linked list



Deletion in circular singly linked list at end

Delete the last node in the linked list

Step1: IF START = NULL then

Write UNDERFLOW

Goto Step8

[END OF IF]

Step2: SET PTR = START

Step3: Repeat Step 4 while PTR -> NEXT != START

Step4: SET PREPTR = PTR

Step5: SET PTR = PTR->NEXT

[END OF LOOP]

Step6: SET PREPTR -> NEXT = START

Delete the last node in the linked list

Step7: FREE PTR

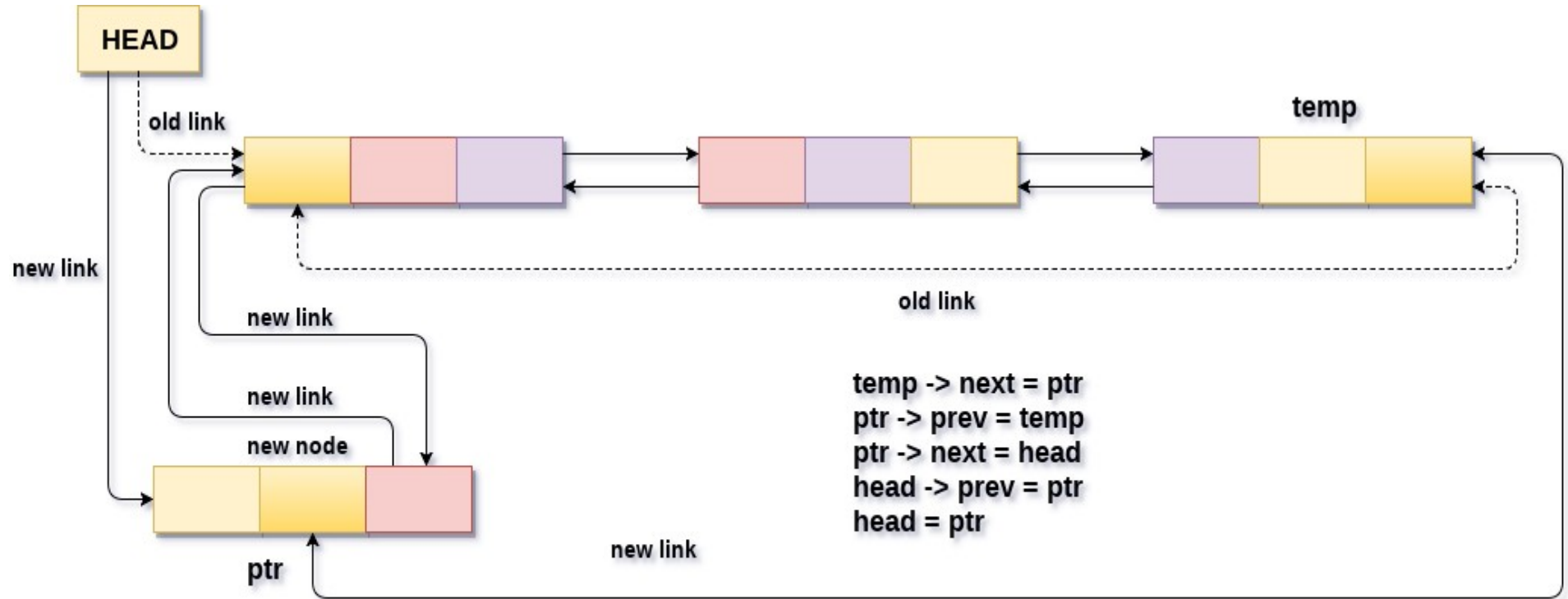
Step8: EXIT

Insertion in Doubly Circular Linked List

A node can be added in three ways

- 1) At the front of the linked list
- 2) After a given node.
- 3) At the end of the linked list.

Insert a node at beginning in Doubly Circular Linked List



Insertion into circular doubly linked list at beginning

Insert a node at beginning in Doubly Circular Linked List

Step1: SET New_Node = AVAIL

Step2: SET New_Node -> DATA = VAL

Step3: SET PTR = START

Step4: Repeat Step 5 while PTR->NEXT != START

Step 5: PTR= PTR -> NEXT

[END OF LOOP]

Step 6: SET PTR -> NEXT = New_Node

Step 7: SET New_Node -> PREV = PTR

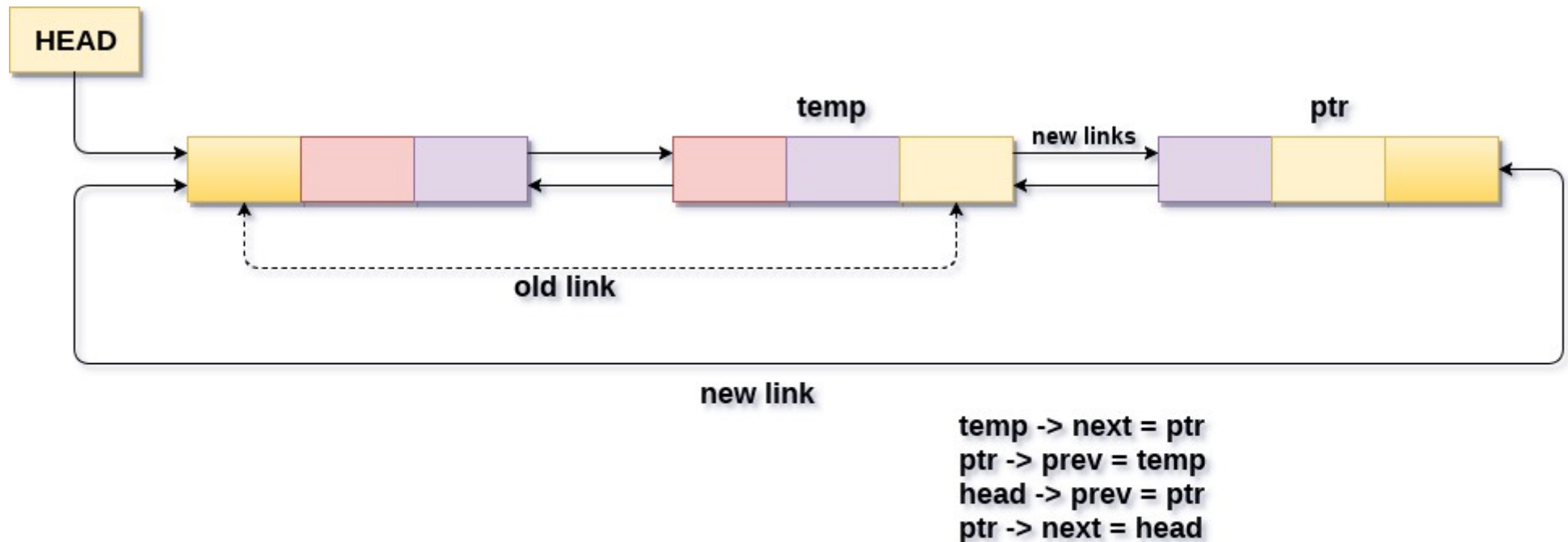
Step8: SET New_Node -> NEXT = START

Step 9: SET START -> PREV = New_Node

Step10: SET START = New_Node

Step11: EXIT

Insert a node at end in Doubly Circular Linked List



Insertion into circular doubly linked list at end

Insert a node at end in Singly Circular Linked List

Step1: SET New_Node = AVAIL

Step2: SET New_Node -> DATA = VAL

Step3: SET PTR = START

Step4: Repeat Step 5 while PTR->NEXT != START

Step 5: PTR= PTR -> NEXT

[END OF LOOP]

Step 6: SET PTR -> NEXT = New_Node

Step 7: SET New_Node -> PREV = PTR

Step8: SET New_Node -> NEXT = START

Step9: START -> PREV = New_Node

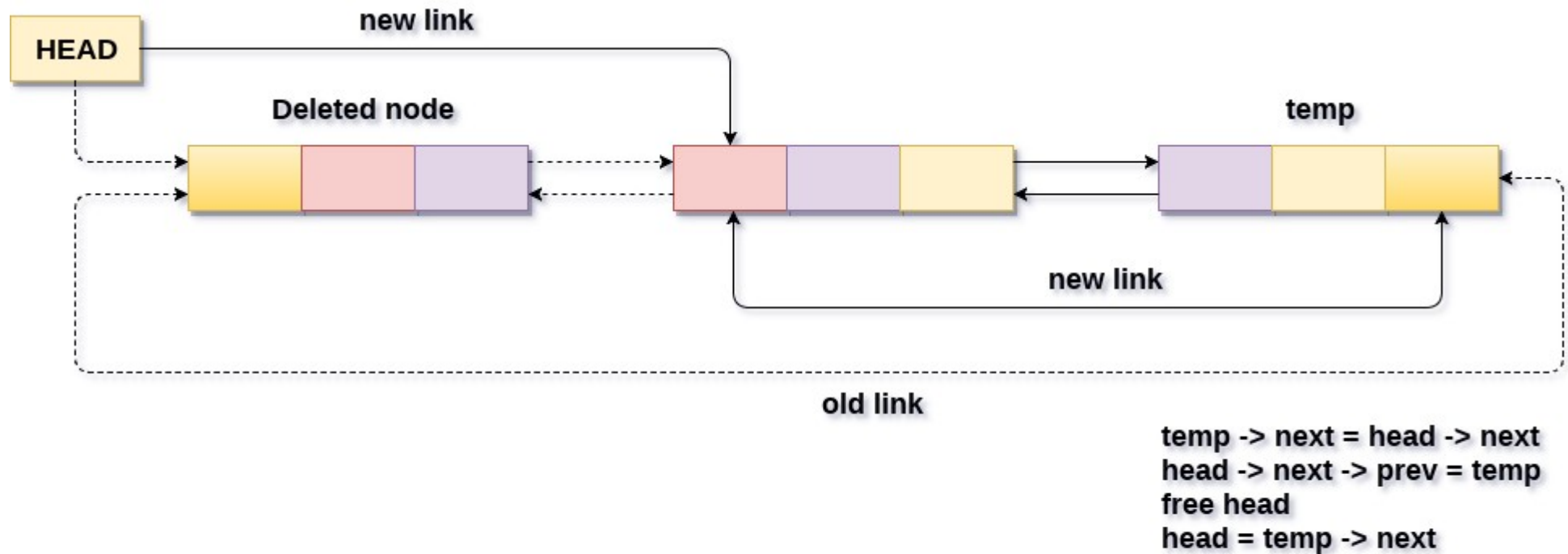
Step10: EXIT

Deleting a node in Doubly Circular linked list

A node can be deleted in three ways

- 1) The first node is deleted
- 2) The last node is deleted
- 3) The node after a given node is deleted.

Delete the first node in the Doubly Circular linked list



Deletion in circular doubly linked list at beginning

Delete the first node in the Doubly Circular linked list

Step1: IF START = NULL then

Write UNDERFLOW

Goto Step8

[END OF IF]

Step2: SET PTR = START

Step3: Repeat Step 4 while PTR -> NEXT != START

Step4: SET PTR = PTR -> NEXT

[END OF LOOP]

Step5: SET PTR -> NEXT = START-> NEXT

Delete the first node in the Doubly Circular linked list

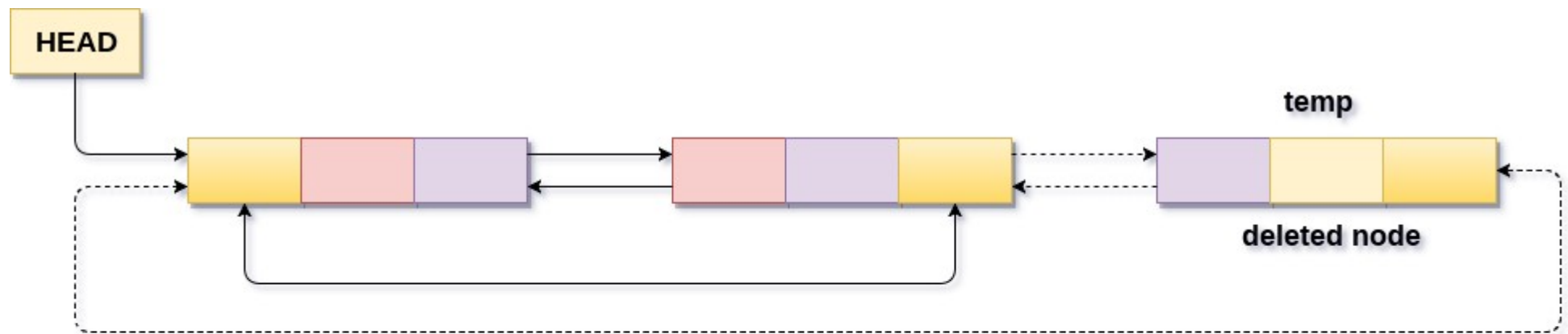
Step7: SET START->NEXT->PREV = PTR

Step6: FREE START

Step7: SET START = PTR -> NEXT

Step8: EXIT

Delete the Last node in the Doubly Circular linked list



```
temp -> prev -> next = HEAD  
HEAD -> prev = temp -> prev  
free temp
```

Delete the Last node in the Doubly Circular linked list

Step1: IF START = NULL then

Write UNDERFLOW

Goto Step8

[END OF IF]

Step2: SET PTR = START

Step3: Repeat Step 4 while PTR -> NEXT != START

Step4: SET PTR = PTR->NEXT

[END OF LOOP]

Step5: SET PTR -> PREV->NEXT = START

Delete the Last node in the Doubly Circular linked list

Step6: SET START->PREV= PTR->PREV

Step7: FREE PTR

Step8: EXIT