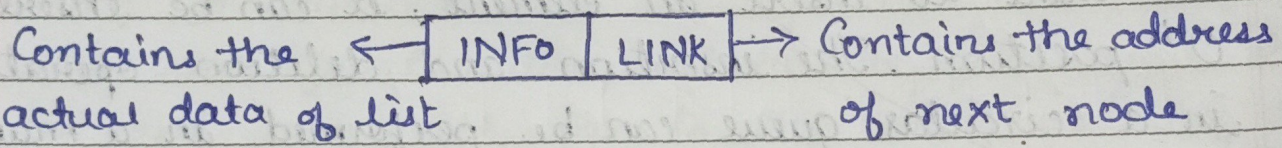
ASSIGNMENT - 3

UNIT 3 :- LINKED LIST

2 Marks

1] What is single linked list ?

⇒ A single linked list is made up of nodes where each node has two parts, the first one is the info part that contains the actual data of the list and the second one is the link part that points to the next node of the list or we can say that it contains the address of the next node



2] An list the all operations of linked list

⇒ 1] Traversing
2] Searching
3] Insertion —
- beginning of the list
- In empty list
- at end of list
- after a node

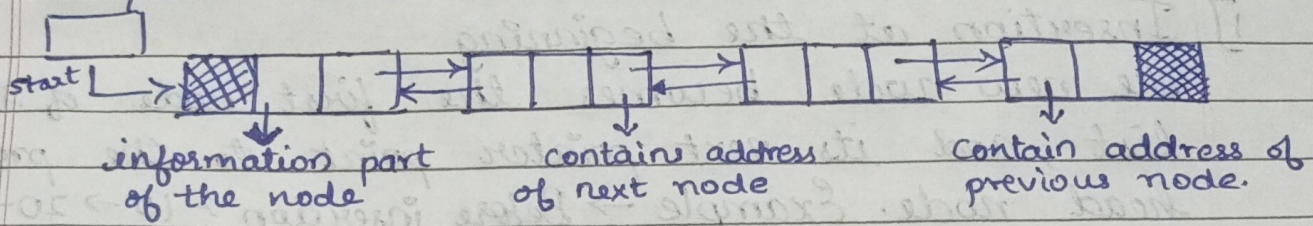
4] Creation
5] Deletion —
- first node
- only node
- between the list node
- end of the list

6] Reversing

3] What is doubly linked list ?

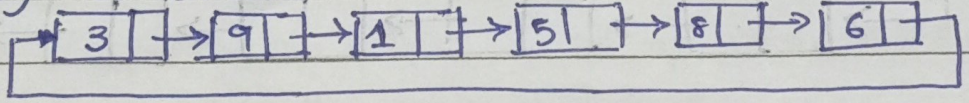
⇒ It is a type of linked list where each node contains three parts :

1. Data : Stores the value or data
2. Pointer to the next node : A reference to next node in the list.
3. Pointer to the previous node : A reference to the previous node in the list.



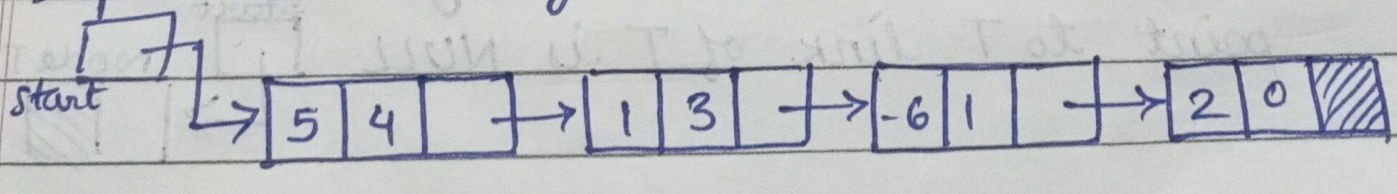
Q4] What is circular linked list ?

⇒ It is a type of linked list in which the last node point back to the first node, forming a circle.



Q5] How to represent polynomial arithmetic with linked list ?

⇒ Let us take a polynomial expression with single variable :- $5x^4 + x^3 - 6x + 2$. In each term we have coefficient and an exponent. For example in the term $5x^4$, coefficient is 5 and exponent is 4. The polynomial $5x^4 + x^3 - 6x + 2$ can be represented through linked list as :-



10 Marks Question

1] Explain Insertion in single linked list with suitable example and diagrams.

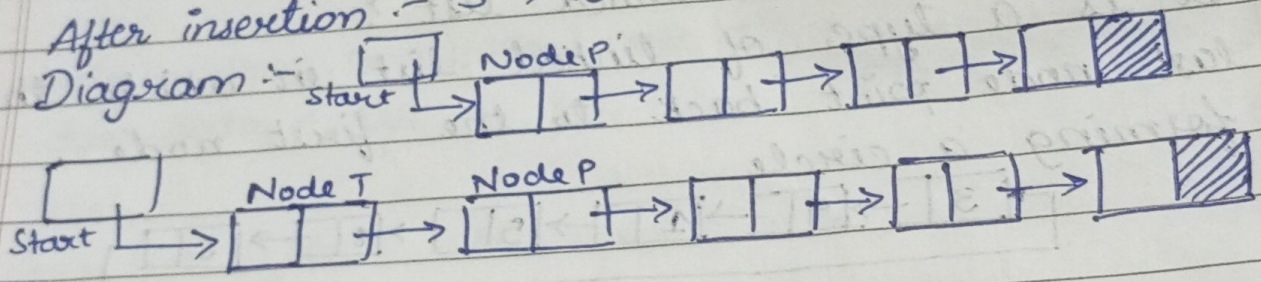
→ In a singly linked list, each node contains:
data : Stores the value
Next : A pointer / reference to the next node in the list.

There are four cases while insertion :

1] Insertion at the beginning
The new node becomes the first node of the list, and its next pointer point to the previous head node. Example → Before insertion :- 10 → 20 → 30 → NULL

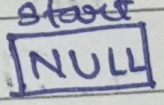
Insert 5 at the beginning
After insertion :- 5 → 10 → 20 → 30 → NULL

Diagram :-

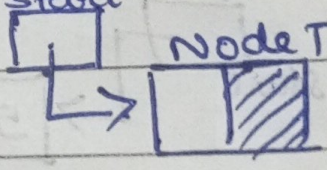


2] Insertion in an empty list.
When the list is empty, value of start will be NULL. The new node that we are adding will be the only node in the list. Since it is the first node, start should point to this node and it is also the last node so its link should be NULL

Before insertion :- Start is NULL

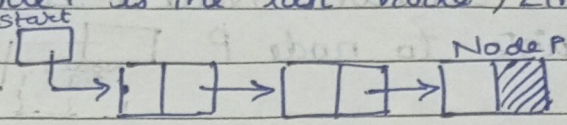


After insertion :- T is the only node start point to T link of T is NULL

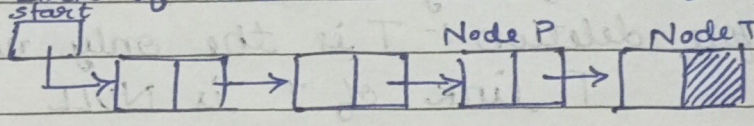


3] Insertion at the end of the list.
the new node is added after the last node (tail) of the list, and its next pointer will be NULL.

Before insertion : Node P is the last node, Link of node P is NULL

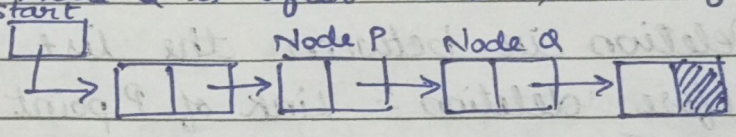


After insertion : Node T is last node, Node P is second last node. Link of node T is null. Link of P point to node T.

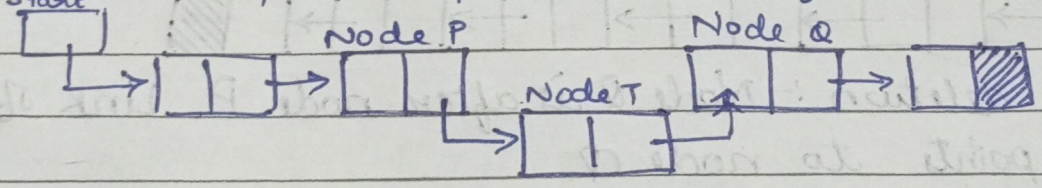


4] Insertion in between the list nodes

Before insertion :- Node Q is after node P, Link of P point to Node Q.



After insertion :- Node T is between node P & Q. Link of node T point to node Q. Link of node P point to node T

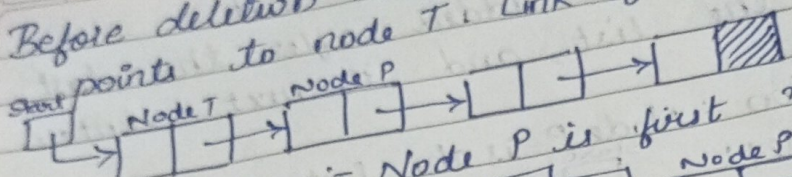


2] Explain Deletion operation in single linked list with suitable example and diagrams.

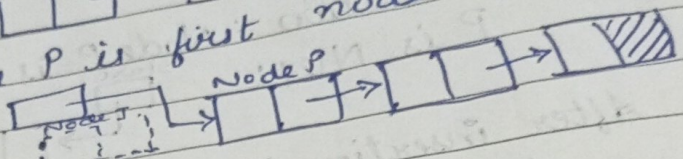
⇒ For deletion of any node, the pointer are rearranged so that this node is logically removed from the list. To physically remove the node and return the ~~money~~ memory occupied by it to the pool of available memory we will use the function free(). There are can be four cases while deleting an element from a linked list.

1] Deletion of first node.

Before deletion: Node T is the first node. start points to node T. Link of node T point to node P

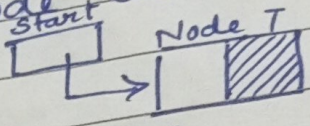


After deletion:- Node P is first node. start points to node P

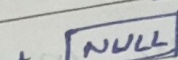


2] Deletion of only node.

Before deletion :- T is the only node. start point to T. link of T is NULL

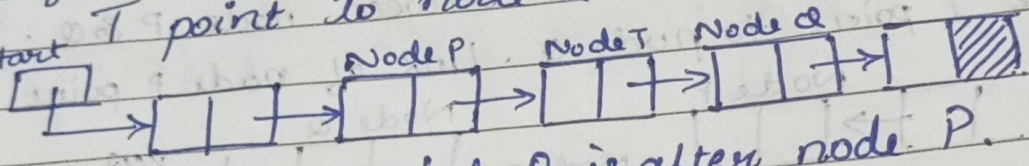


After deletion :- start is NULL

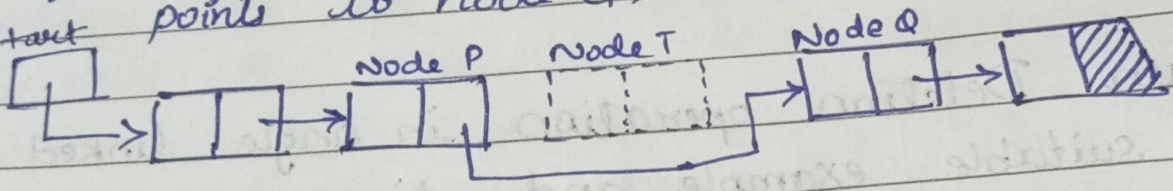


3] Deletion in between the list nodes.

Before deletion :- Link of P point to node T. Link of T point to node Q.

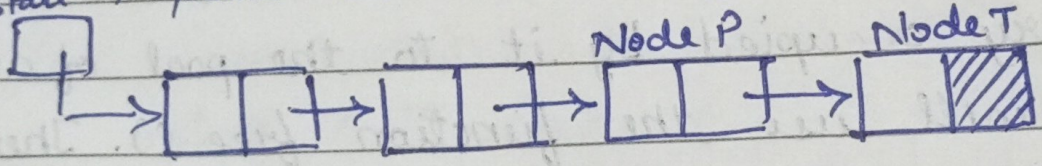


After deletion :- Node Q is after node P. Link of P points to node Q.

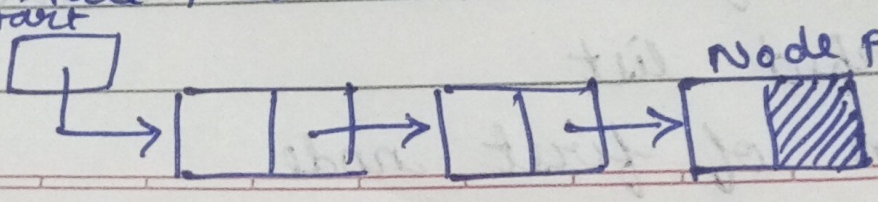


4] Deletion at end of the list.

Before deletion :- Node T is the last node. Link of P point to T. Link of node T is NULL.



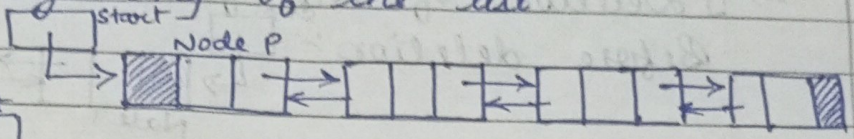
After deletion :- Node P is last node. Link of node is null.



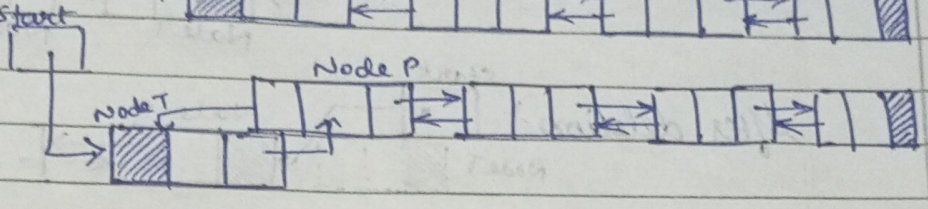
3] How to represent Insertion operation in doubly linked list with suitable diagrams.

⇒ 1] Insertion at beginning of the list

Before insertion:



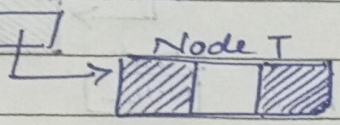
After insertion:



2] Insertion in an empty list

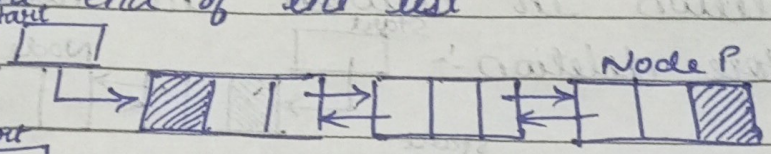
Before insertion :- Start [NULL]

After insertion :- Start

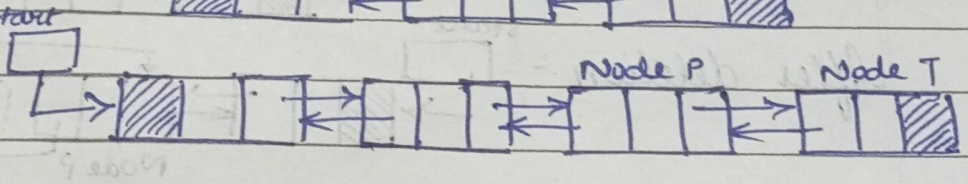


3] Insertion at the end of the list

Before insertion :-

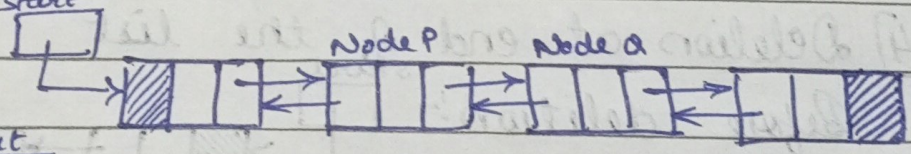


After insertion :-

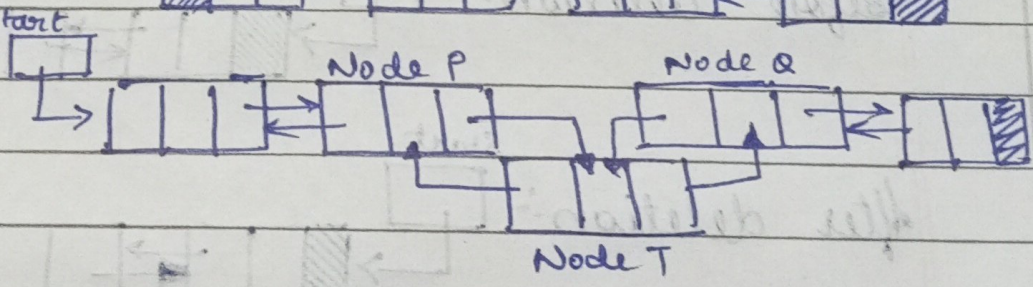


4] Insertion in between the nodes

Before insertion :-



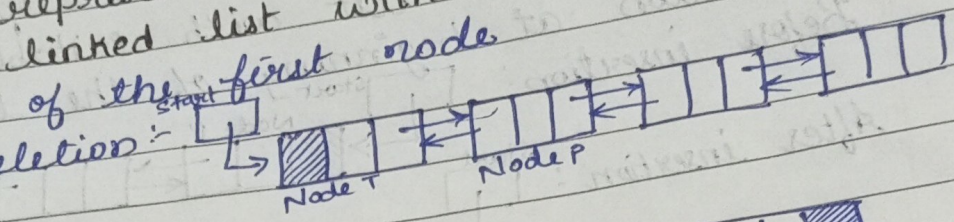
After insertion :-



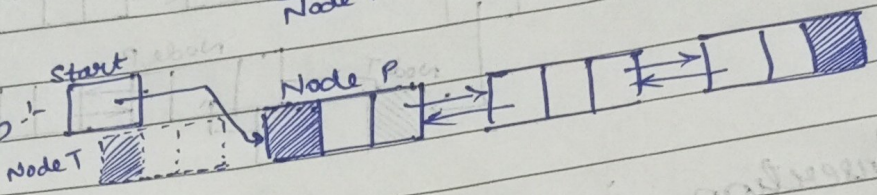
4] How to represent deletion operation in doubly linked list with suitable diagrams.

⇒ 1] Deletion of the first node

Before deletion :-

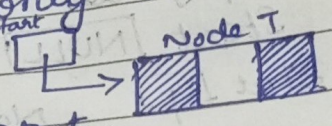


After deletion :-

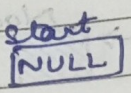


2] Deletion of the only node

Before deletion :-

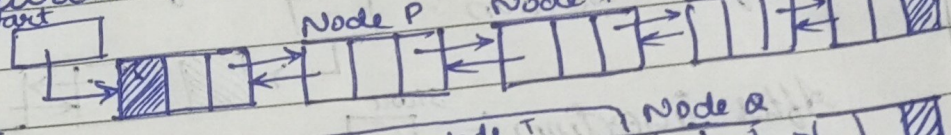


After deletion :-

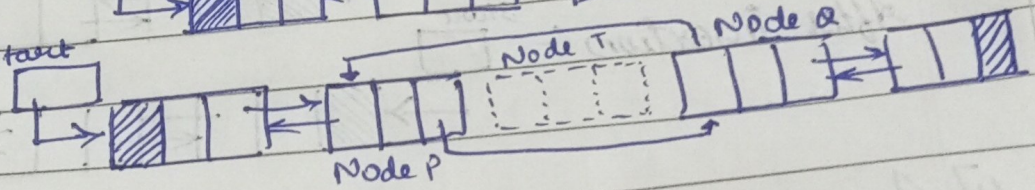


3] Deletion in between the nodes

Before deletion :-

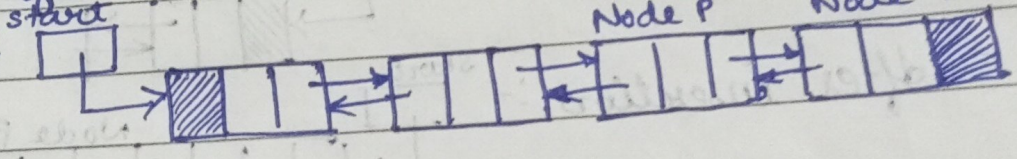


After deletion :-

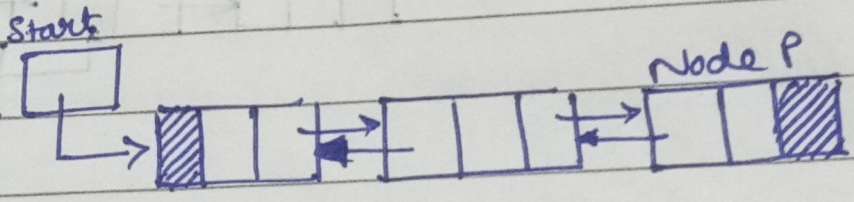


4] Deletion at end of the list

Before deletion :-



After deletion :-

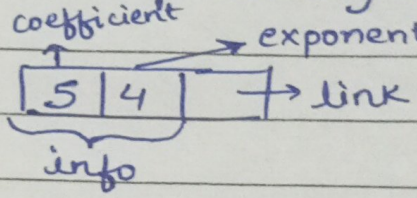


5] Explain polynomial arithmetic with linked list and give example with neat diagrams.

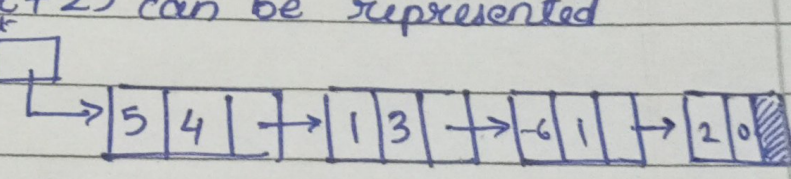
⇒ In polynomial arithmetic, each polynomial is expressed as a sum of terms, where each term has a coefficient and an exponent. Using a linked list to represent a polynomial allows efficient operation such as addition, subtraction, multiplication. Let us take a polynomial expression with single variable :-

$5x^4 + x^3 - 6x + 2$

For example, in term $5x^4$, coefficient is 5 and exponent is 4. The whole polynomial can be represented through linked list where each node will represent a term of the expression. The info part of the node contains coefficient and exponent and the link part is same as before and will be used to point to the next node of the list. The node representing the term $5x^4$ can be represented as :-



The polynomial $(5x^4 + x^3 - 6x + 2)$ can be represented through linked list as



Here 2 is considered as $2x^0$ because $x^0 = 1$.