unit-III

STACKS

Detinition:

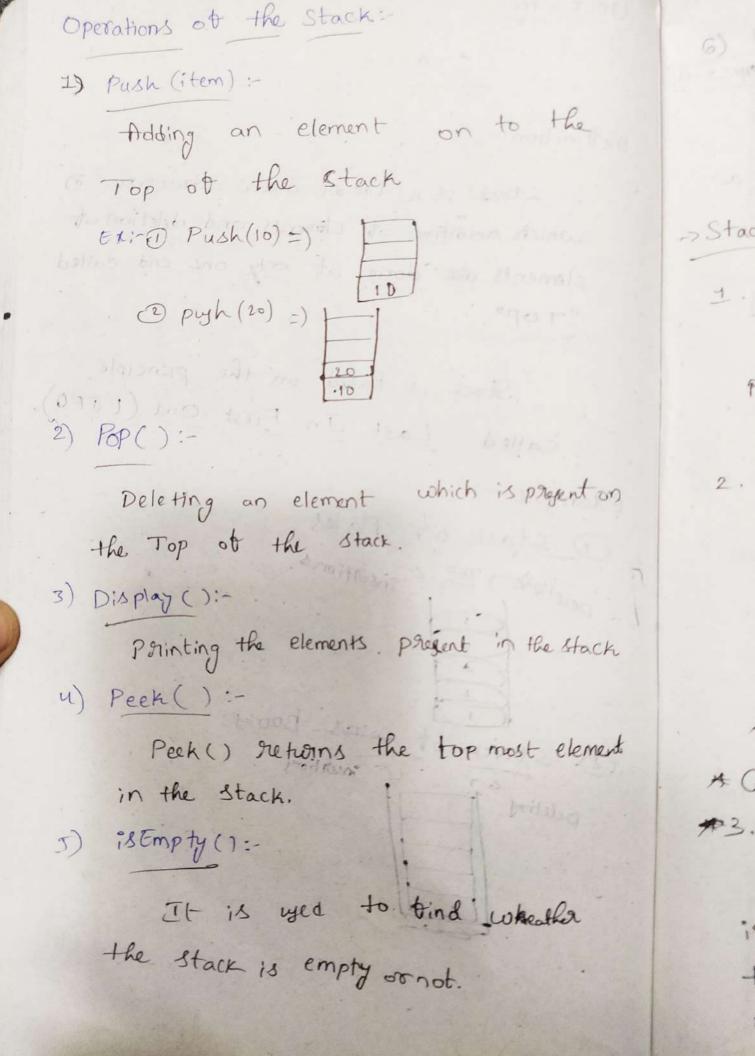
chich addition of Elements and deletion of elements one done at only one end called "TOP".

- model of the

Stack is based on the principle called Last In First Out (LIFO).

Deletion Top Consolidado Books:

a societies stare is empty against



It is used to find weather the Stack is tull or not.

6) PS Full (): Hall seems of the ADAM A

- Stack Crea ted Terms:

1. top: top is a variable that which always Points to the tomp most element in the . PARS to moitocolossi + stack.

2. STACK ONER FLOW: -

It the stack is already tull, and it will try to add one more element, it leads to an error situation called "STACK OVER FLOW!"

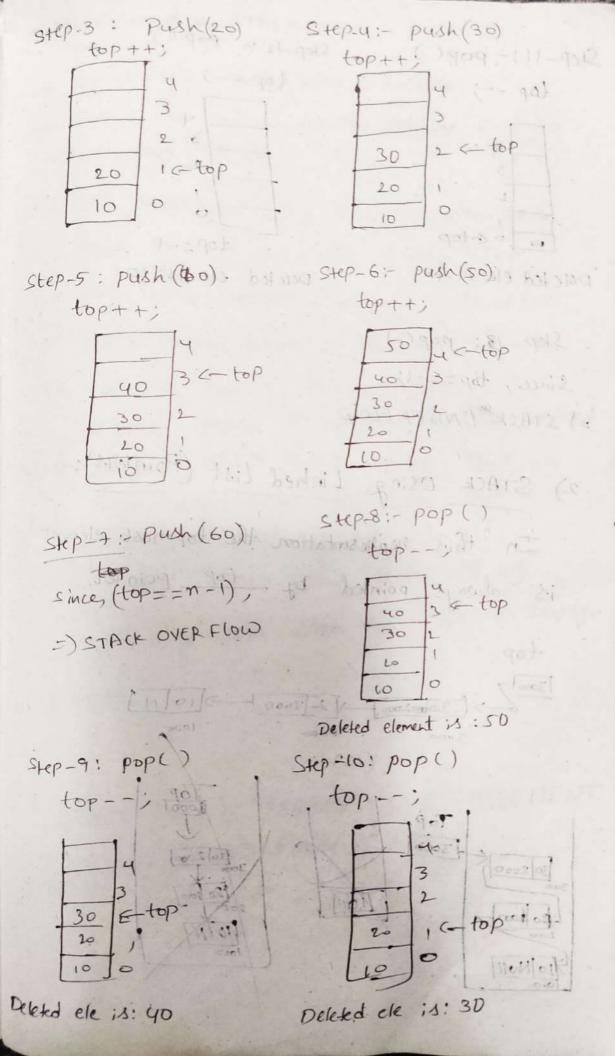
* STACK OVER FLOW meany Stack is full.

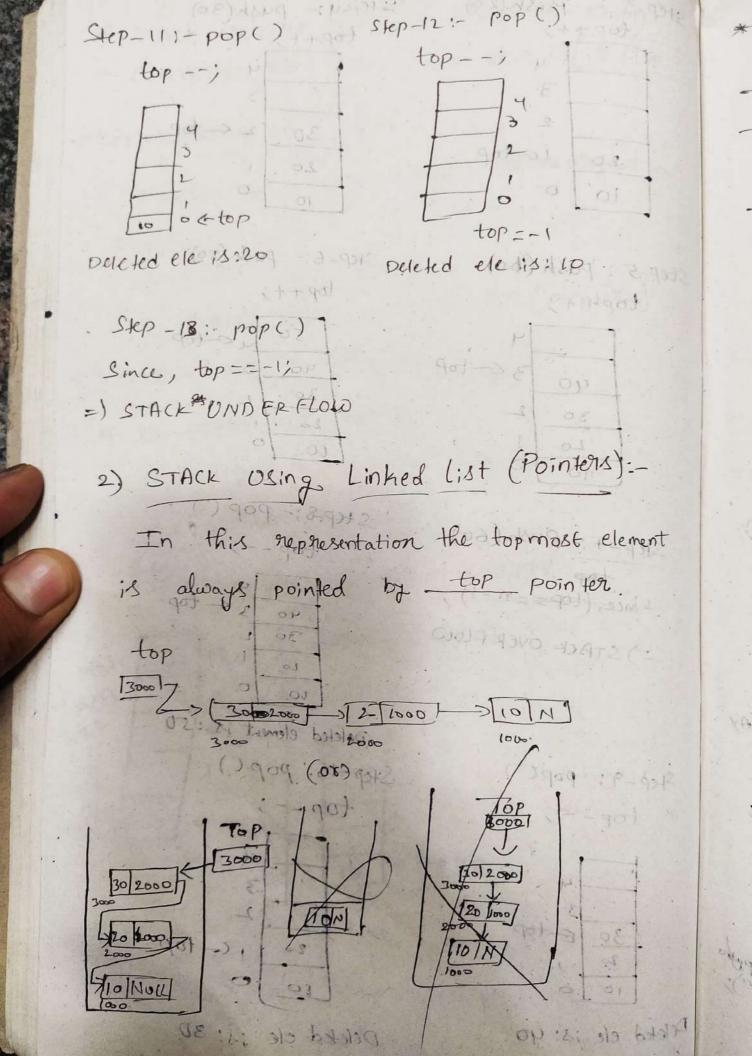
* Condition for stack overflow =) (it (top = = n-1)

#3. STACE UNDER FLOW:

It the stack is alguady empty, and it we try to delete one more element from the from the stack it leads to an equon Situation Called "STACK UNDER FLow".

* STACK UNDER FLOW =) Stack is Empty * Condition from stack under thow =) [it (top: -> Representation of STACK: to nepryent a There are two ways 200031 Stack, 1) STACK USING ARRAYS. 2) STACK USING LINKED LIST (Pointers) 13) STACK Using ARRAYS: * Declaration of STACK, int a [5]: top = -1; Initially, STACK is EMPTY Step-2:- Push(10) 42012 2(3) 22) is Condition for clacking protoffice 2[1] 41137 930 MO 10M a[0] 1 · of made se top top =- 1 THE STEET from the stack it leads to an. escen Situation Called "STACK EMIDER-





- * Properties of a STACK:-
- -> STACK is a linear data structure.
- > STACK is based on the principle "Last In First out (LIFO).
- -> All insertions and deletions are only)
 done at only one end called "Top"
 - nony ones element can be pushed (or)

 (Poffed) Popped from a stack at a time.
 - -> Elements can be removed (in) only in surveye order, in which they are inserted
 - Pugh any item when the Stack is
 - -> STACK UNDER FLOW occurs, it we pop any tem when the stack is Empty.

PAINTE (" 10 POST - 1- 100) STATES

MED AT CHAT OF DETAILED

White a C PROGRAM TO IMPLEMENT STACK USING AARAYS. (Cab-week-5)

Sulfa (choice)

```
#include < stdio.h>
   #include cconio.h>
   #include cstdlib.hz
   Moid push (int item);
    Void POP ( );
   void display ();
   sol balang 2d and translated for
   int stack [10] $ top=-1, n, ele, is
    void main () bavonal ad mes dismala .
      severe ender, to which they are
   int choice; 01017 AJVO MATE
    Li scren; Mins. moli Har
       Print & ("In Enter the size of the Stack:");
     scant (",d",4n);
     consider (1) of more more xing gove
          Printt ("INIT ** MAIN MENU**);
           Print ("in 1. POSH 2. POP 3. DISPLAY
                    4. EXIT ");
2 Print & Cin Enter Your Choice:");
           scant ("1.d", &choice);
           Switch (choia)
                   paint + ("in Enter the Data:")
                        Scant ("/d", fele);
```

Void

read tobecom break; L- - - may-Push (ele); Albheak; Hours on I think case 2: pop(); Doneak; case 3: display (); break: case 4 = exit(1); baleak; print ("in wrong (HOICE:"); detault: bleak; get ches; void push (int ele) Printly (M) Those , and ((top ==n-1) a+2 (2) Print (" FIN STACK OVER FLOW"); poset (1) on the element in the time acc top++3 god - 2: (0=i) Rot Stack [top] = ele: of prints ("in The given data is pushed into the STACK");

Void Pop () 2 8 ? b (top = = -1) PHINTE ("M STACK UNDER FLOW-NO ELEMENTS IN THE STACK!); eise Print ("In Deleted element is T.d", stack prints ("on whom of Holde void display () 3 it (top == -1) Print ("in There the (bis) STACK to Display:"); Thinks ("M) CLACK ONER FLOW"); E The elements in the STACK are! toa (i=0 : ic=top) i++)

Critical South Charles the Delett clanest is 20 cental good charact : 2 The Delid clament is 16. Output i-Enter the size of the STACK: \$3 * * * MAIN MENO * ** 4. PUSH 2. POP 3. DISPLAY 4. EXIT Enter your choice: 4 Entol the element to push: 10 The given data is pushed into the STACK Entell your choice : 2 decinos souloning Entor the element to push 1:120. 360120 11 the given data is pushed into the STACK. Enter jour choice:1 Enter the element to puy h: 30 h. The given data is puyhed into the STACK. Entor your choice ! 1 10 3 bor bounds Enter the element to push: 40 biok STACK ONER FLOW , (1)909 bior Enter your choice: 2 (1) yours biov The Deleted element is 30 biox

Enteryour Choices & 2 The Delete element is 20. Entor your choice: 2 The Delta element is 10. i thoughton Enter gour choice: 2 No elements In the STACK WES UNDER FLOW * * * ONSM UTAM + + + Enter your Choice: 4 909 1 11209 * * * * * * * * * * * * * * * While a C program to implement STACK
Using Cinked List. (Lab program) # include < conio.h > I was Barry # include < stalibelizary or desirals at 18+13 the given doct a is pulled int data; hugger hands some some some of stand of the barbon of the some of the sound of the sou struct node *top, *tempis*new_node; woid push () the post of the bion void Pop(); Golf 43 vo DATZ void, display (); = assorb. Rucy Rates Twoid Search ()] . Journal of Marine

void main () Asset bloy Ş int choice is solow show that I show ask exact (" on total - the date "): while (1) Start " of som made data) 9 m MAIN MENU"); Parint to ("In 2. POP 3. DISPLAY Paint + ("In 4. PUSH 4. Exit ("); Paint & ("in Enter your choice:"); scant ("/d", & choice); Switch (choice) trove shore were coper work + god 8 Case 11 push (); baleak; : Betch Cos Case 2: pop(); bokak; () gog . case 3: display (), 690ak; (11011 = 90F) 11 case u: exit(1); Friedle (" no 1 Knowldone no chemin 12 in the 3 (C'tail (110h = + there = qot) di getch (); Print ("In Delated node 15 -1 d") Hard : JJOH = 90J-(top);

Void push () new node = (struct node*) mallor (size of (struct my Print ("in Enter the data:"); 111 Klide. scant (" ./.d", & new node > data); new_node -> next = NULL; rayit (top == NOLL) top = new node; else "should love topol ar") thing clouds by by thous new node -> next = top; top = new_node; 10 day 11 2/03 b Skak ; getch (); 7 CASO 21 POPEDS Void pop() Copologich 18 8200 g it (top = = NULL) Hoold (1) (1) (1) (a) (1); Print ("In There are no elements in the list"); it (top->ment = = NULL) else 3(2) ASTA? Printt ("in Deleted node is -/d", top->date top = NULL; tree (top);

```
e132
nuct node).
                            UMEN WIRM
              Palint C'In Deleted node is 1.d.
                              top -> data);
                        top = top -> ment
                                     L: sorodo Jung
                                    Enter the data: It
                                   Enter good choice. I
                     getch();
                                   ox soloh all roll
                                  Enton Just Choice: IL
              void display()
                                  Enter the data: 20
                 if (top = = NULL)
                   Print t (" There are no (nodes) elements in the list");
                else
                     Printt ("in Elements in the list are: in');
                     -temp = top;
                      while (temp! = NULL)
, the
                            Print & C'/d 'n', temp -> data);
                            temp = temp -> next;
" top->data)
```

Out put:

MAIN MENU

1. PUSH 2. POP 3. DISPLAY 4. EXIT cotob - god *********

Enter your choice: 4

Enter the data: 10

Enter your choice: 4

Enter the data: 20

Enter your choice: 1

Enter the data: 20

(Lion = = not) +

· (yolgaib blow

o icodstop

2/4/3

Phint (" Thore one incorpoded) elements in the List");

STATES JOHN

Print ("10. Elevant in the book one : m");

- (conp = 10P7 . (Lion = 1 ams) slike

Print (" 1.d. in") - temp -> dista): temp = temp - next:

Reportentation of Anithmetic Expressions: As There are three Notations to Represent Arithmetic Exporession. 1) Intik Expression (on) Not ation . a) Pretix Expression (on Notation

a) postfix Expression (or Notation

4. Intix Expression (or) Notation:

Detinition:

In this notation, operator comes between the operands,

ath, water at his it got

a-b released jet resolute their 2. Pretix Expression Goodustation ?:-

Definition:

In this notation, operator comes bettere

the operands.

Exit tab solutions begin and the second

* about me

3. Posttin Expression (or) Notation:

Detinition:

In this notation, operator comes after the operands.

NOATH !

Ex:- ab+,

ab*

Applications of STACK: 1) Evaluation of post tix expression 2) Converting the intix obsession to post in expression. 3) Conve Recursion in totals manning weeps in the set of 4) 5) 6) 1. Evaluation of postfix expression: Algorithm for evaluation of Postbix Expressions Step-Y: Read the posttir expression from lett to Tight, character by character. Entil the last che perstorm the below steps tool Cach chalacter. Step = 2: It the input character is operand, Push it on to the Stack. Step-3: It the input character is operator. then pertosm the below three steps one by one. (i) pertonin pop () operation to 2 etimy of rate lands (ii) Apply the operator on operands (iii) Push the result on to the

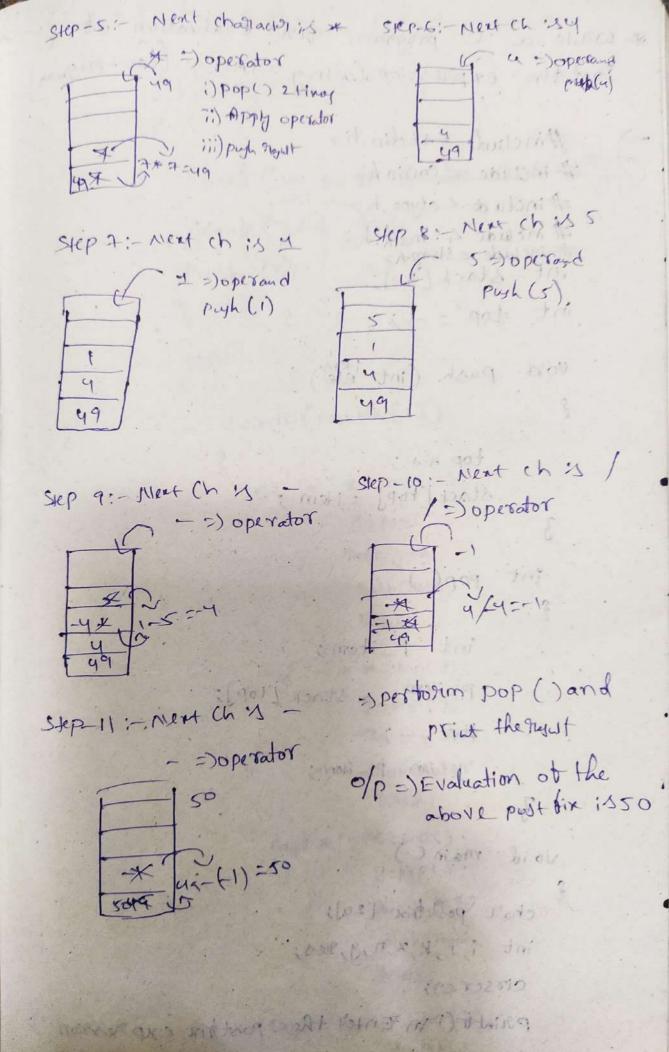
STACK.

9+0-4: Atter reading all the characters, perton populaperation and print the gosult on the somen. nession. EXAMPLE 1:-Evaluate the post tix expression 6 8 + 9 2 -/ The horizon of the properties of th Step - 1 :- 6 -> operand step 2: Nort character is published ussions A Li Police Of the san one 66 167390 (= 1 Step-3: Nent Charlacker is + Step-4:- Next chariacter is + =) operators C pugh (9) 8 -6 + 8 = 14 14 spile 3 = 21 /1 14 15 14 24 18 19 19 T. Step -5: Next character is 2 step-6: Next character is -PS 2 =) operand 89 etimy push(2) operands to the

Step-1: Next character is /=) operator 1 /4 = 2 =) pertognepop() and print the Twalt of: Evaluation of the above post fix expire Example 2:3 Evaluate the tollowing post time expression. 752,+,* 415-/-Step-2:- Next Character is 5 Step 1: Figur Characteris 7 5 =) operand 7=) operando 1 Push(5) Way Goodaday of H ons mol = P Step-3: - Next character is 2 Step-4:- Next Character is + 2=) operan of -t=) operator

7 =) pop() 2 fing

=) Apply operator Push (2) PUSh 9yult 5+2=7



```
* write a c program foor evaluation of
      Post tik expression (using STACK) (Cob - program
         #include Estdio.hz
        # include < conio.h>
         #include & ctype.h7
        # include < math. h>
            stack [20];
         int top = 4;
         void push (int item)
          top ++;
          stack[top] = item;
         int pop()
               int P_item;
    Por Poilern = Stack [top];
                                    Fring Pir GUZ
       home top 1-;
     networ, P-item;
10241 xil 139 avois
        visid main ()
          chan posttix [20];
          int i, i, k, x, n, y, ses;
          claser ();
         parint of "in Enter the posttix expression:")
         Jet. s (posttix);
```

```
4071 (1-0 ; Posttin [i] !=" 10"; i++)
no Stay
                     it (isalpha (post tix [i])).
                         Print & ("In En 1891 the value of 1.C:", POST 6th
                         Scant ("1.d", &n);
                    Push (n);
                         e13e
                            Switch (postbix [i])
                              case '+: x = pop();
                                        ; ( ) gog = b
                                        9105= 7+2;
                                         Push (res):
                                         bollak;
                                Case '=' := x = pop();
                                         y = POP ();
                                          96y = y -x;
                                         Push (neg);
                                          b9leak;
                                case * ':- x = pop ();
                                          y=pop();
                                         94= 7 * 1;
                                           pugh (My);
                                           balak;
:");
                                Case 1 : x=pop();
                                            Y=AP();
                                           nei-1/x.
```

break; Parint & ("In Result of postfire expression is 1.c", POP()); Jetch (); Converting 2 1/200 deco1 blesto ... (() Mensy The year of (Carl dies -(Act Rd 270 pag 51 X - 1 = 2 2 3 500 11) 909 t. はかは一時 : (wo xun LAMA PARTH STORY

Convolting Intinix Explesion to Post fin expression (using STACK): Algorithm: all de your all ma 41 m rotoggo al 109 (1) Step -Add the left paranthesis (at the beginning and right paranthesis at the end of the expression. Step-2: - 17112 in to gol Initialise the STACK to be EMPTY. Step = 3 311 or most book born while Scan the expression from left to right chalacter by character and pertorum the below steps. Step-4: It the input character Push it on to the STACK i) Left Parlanthesis - The Planifor Add it to the POST FIX Expression. ii) operand (A/B/C/D...) a) It top of stack contains Left iii) Operator Pallanthesis, Rush the operator on to the stack b) It the input operator (Senior) has high precedence than the operator (Junior) on the TOP of the STACK, push the operator (senior) on to the STACK.

- c) It the input operator has lower or equal precedence than the operator on the TOP of the STACK, then
- (i) Pop the operator on the top of the stack and add it to POSTFIX EXPRESSION.
 - (ii) Add the input operator on to the top of the STACK.

iv Right Pallonthesis Salviolaria tripical

notexisters at to

- of some out stilletter a) Popall the operators from the STACK and add them to the postfix Expression
- b) Pop the left Parantheris and discard Joseph togit of fr

Step-5: Print the resultant POST FIX Expression on the Monitor.

o) It top of stack contains Lebt

Add of to the POST IIX Expression

(A B C / D -).

of no rolong all dus stallmordi the stack

Rotorogo (iii

briorogo (il

b) It the input operator (senior) has

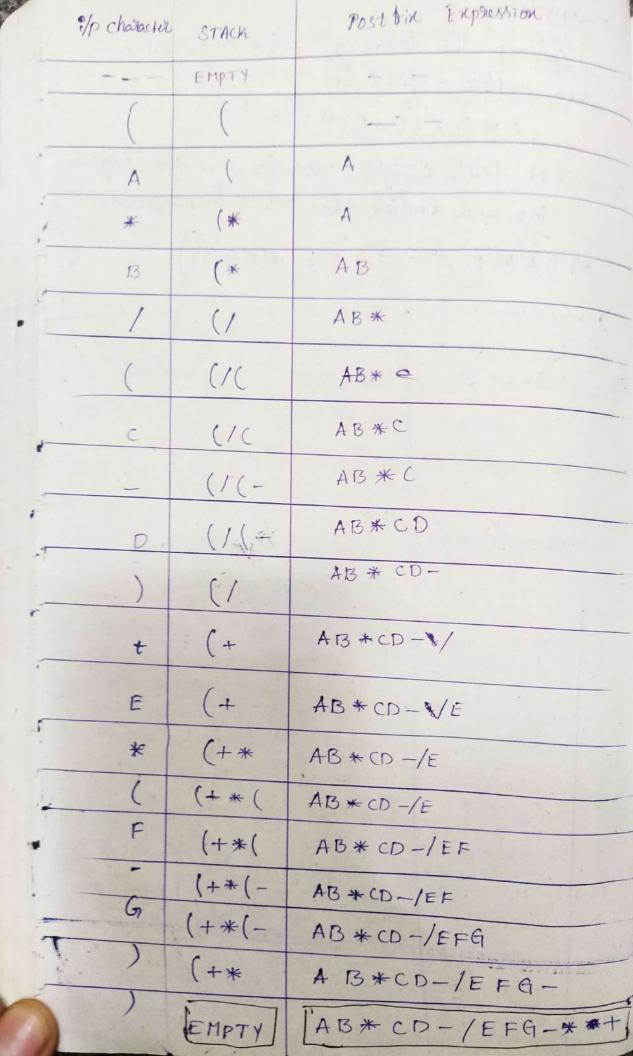
high procedures than the openta

10002 at to 90T all me (rower)

post the operator (sminr)on to

the STACK

Example:convert the bollowing, intix expressions into posttix expression. A * B / (C-O) + E * (F-G) 301:- Add lett & right paranthesis at the beginn-ing and Endoot the intin expression =) (A * B/(C-D) + E *(F-G)) . #JA O(C A8+ = 2 # 0 4 2000



The nesultant posttix expression is AB*CD-/EFG-*+ Example -2: Convert the tollowing intix expression to postfix expression a/b-c+(d, * e)-a *c (a/b-c+(d*e)-a*c) :/p charack Posttin expression. STACK Empty a ab. 6 ab/ ab/CA ab/c: (+ ab/c+ (+(ab/c-d (+(9 ab/c-d (+(* ab/c-de (+(* ab/c-de* (+ a blande * ++ ab/c-de*ta ab/c-de*toà

ab/c -dex pac (-* ab/c-de*+ac* EMPTY The resultant post fix expression is ab/c-de * +ac* Example-3: Convert the tollowing intex expression into Posttix expression A+(B*C-(D/E1F)*H) Add the left para (at the beginning and) at the end Then, (A+(B*C-(D/E MF)*H)). Input POST fix Expassion STACK chalactor EMPTY A (+ -(+ ((+(AB * (+(* AB 1 (+(* ABC . (+(-AB C* (+(-(ABC* (+(-(ABC*D (+(-(1 ABC*D (+(-(/ ABC*DE (+(-(// ABC*DE (+(-(// ABC* DEF (+(-ABC* DEFA/ (+(-* * ABC*DEF11

ABC*DEF N/ H ABC * DEFX/H*-ABC* DEFA/H* -+ EMPTY white a c program for Converting Intix expression to postdix expression (Lab program) #include estdions # include c conio. L> # include (ctype.hr # include astring. h> chan stack [20], intin [20], posttin [20]; ent top = -1; void push (char ch) top ++ in may 15/103 pm) + 1 mm. stack [top] = ch; char pop () ş char ch; ch = Stack [top] top -- ; stetern ch; 3 int precedence (charich) mild a Lid xidled switch (ch) Coje '(: = networn 0) C-12 + : 0815 code '- ! = 91etrain 1; coje *:

```
case '1': gretien 2;
                case in : The horn 3:
void main ()
    int 1, j = 0;
    circor();
    print + (" in Enter your expression = ");
    Scort ("%)
     Print & C in Enter your intix expression
              (Add '(' at beginning and') at
              end):");
     scan + ("1.5", intix);
    (Push ()
     to 91 ( =0 ; "intix [i]!-10'; i++).
          it (isalpha (intin [i]))
               Postfix [i] = intix [i];
                j++; 149410
            else
```

Cayl 1/:

Switch (intix[i]) case (: push (intix [i]); Cage ')' : while (stack[top]! = '(") it (stack [top] == (') push (intin [i]); PILL while (precedence (stack[top]) x = precedence (intix[i]) post tix[i]=pop(); Pulh (intix[i]); break; Parette in Enter no of planens with ("no The switched". "Post to the Expression is: 1/5", Posttix) : Done or Ditwer

```
Revolving the list using stack:
white a c program to greate the given duty
                          ( Lab program)
using stack.
   # include cstdio. h =
   # include a conio. hy
    int stack [20], top = -17
roid Push (int ele)
      top ++;
        stack [top] = ele;
int = Pop(=) (Bolles de) es abours sido
      E
         int a-ele;
         9-ele = stack [top];
         top -- ;
         netwan I.ele;
                      (Blacking) dus
     void main ()
    S
        int a[20], n, i;
       croscrc);
        Porint & ("in Enter no. of elements in the list:");
    scont(" 1.d ", &n);
        Paint & (" in Enter the elements in the
                        : ("M: 18:1)
```

```
seant (" 7.d " & a[i]);
     don (1=0; icn; i++)
         Push (a [:]);
     3
     $09 (i=0 ; i<n ; i++)
          a [i] = pop();
      Print & ("in Revorsed (ist is: \m);
     4091 (i=0 ; ikn ; i++)
     2
          pariate (" /d ", a [i]);
      getch();
   Enter no. of elements in the list : 5
Imput:
   Enter the elements in the list:
    10 20 30 40 50
output:
   Prevoised List is:
   50 40 30 20 10
```