1.main.c

```
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <math.h>
#include "header.h"

int main(){
    char infix[100], postfix[100];
    printf("Enter a valid infix expression: ");
    scanf("%[^\n]s", infix);

    infixToPostfix(infix, postfix);
    printf("Postfix expression: %s\n", postfix);

    int result = evaluatePostfix(postfix);
    printf("Evaluated result: %d\n", result);
    return 0;
}
```

2.header.h

```
typedef struct {
   int top;
   int arr[100];
} Stack;

void init(Stack *s);
int isFull(Stack *s);
int isEmpty(Stack *s);
void push(Stack *s, int value);
int pop(Stack *s);
int peek(Stack *s);

void infixToPostfix(char* infix, char* postfix);
int evaluatePostfix(char* postfix);
```

3.logic.c

```
#include "header.h"
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <math.h>

void init(Stack *s) {
   s->top = -1;
}

int isFull(Stack *s) {
   return s->top == 99; // Adjusted for MAX = 100
}

int isEmpty(Stack *s) {
   return s->top == -1;
}

void push(Stack *s, int value) {
   if (isFull(s)) {
      printf("Stack overflow\n");
      return;
   }
   s->arr[++s->top] = value;
}

int pop(Stack *s) {
   if (isEmpty(s)) {
      printf("Stack underflow\n");
      return 0;
```

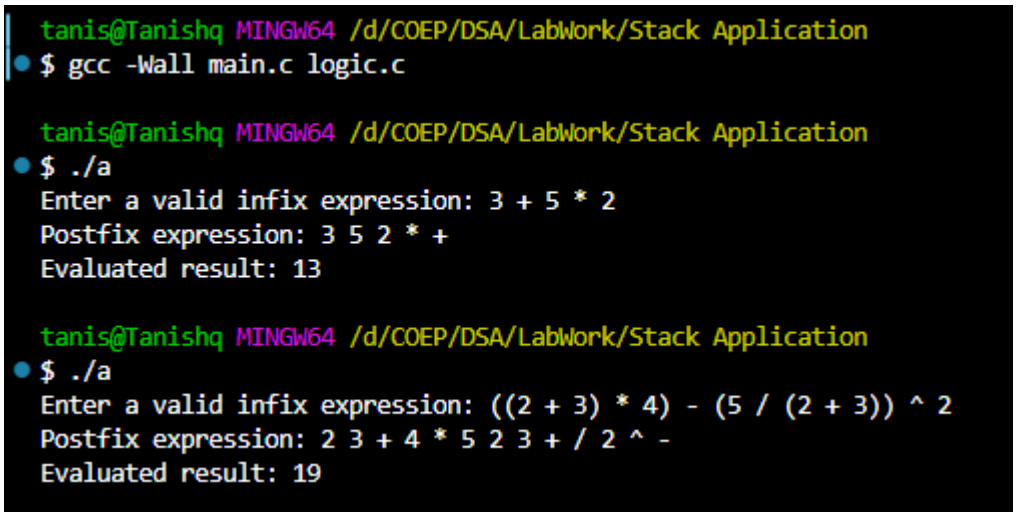
```
    }
    return s->arr[s->top--];
}

int peek(Stack *s) {
    if (isEmpty(s)) {
        return 0;
    }
    return s->arr[s->top];
}

int precedence(char op) {
    if (op == '+' || op == '-') return 1;
    if (op == '*' || op == '/') return 2;
    if (op == '^') return 3;
    return 0;
}

int isLeftAssociative(char op) {
    return op != '^'; // All operators except '^' are left associative
}

void infixToPostfix(char* infix, char* postfix) {
    Stack operators;
    init(&operators);

    int i = 0, k = 0;
    while (infix[i] != '\0') {
        if (isspace(infix[i])) {
            i++;
            continue;
```

```
    }

    if (isdigit(infix[i])) {
        while (isdigit(infix[i])) {
            postfix[k++] = infix[i++];
        }
        postfix[k++] = ' ';
        continue;
    }

    if (infix[i] == '(') {
        push(&operators, infix[i]);
    } else if (infix[i] == ')') {
        while (!isEmpty(&operators) && peek(&operators) != '(') {
            postfix[k++] = pop(&operators);
            postfix[k++] = ' ';
        }
        pop(&operators); // Remove '('
    } else {
        while ((!isEmpty(&operators) && (precedence(peek(&operators)) > precedence(infix[i]))) ||
               ((precedence(peek(&operators)) == precedence(infix[i])) && isLeftAssociative(infix[i]))) {
            postfix[k++] = pop(&operators);
            postfix[k++] = ' ';
        }
        push(&operators, infix[i]);
    }
    i++;
}

while (!isEmpty(&operators)) {
    postfix[k++] = pop(&operators);
```

```
        postfix[k++] = ' ';
    }

    postfix[k - 1] = '\0'; // Null terminate the postfix expression
}

int applyOperation(int a, int b, char op) {
    switch (op) {
        case '+': return a + b;
        case '-': return a - b;
        case '*': return a * b;
        case '/': return a / b;
        case '^': return (int)pow(a, b);
    }
    return 0;
}

int evaluatePostfix(char* postfix) {
    Stack operands;
    init(&operands);

    int i = 0;
    while (postfix[i] != '\0') {
        if (isspace(postfix[i])) {
            i++;
            continue;
        }
        if (isdigit(postfix[i])) {
            int num = 0;
            while (isdigit(postfix[i])) {
                num = num * 10 + (postfix[i] - '0');
```

```
            i++;
        }
        push(&operands, num);
    } else {
        int val2 = pop(&operands);
        int val1 = pop(&operands);
        int result = applyOperation(val1, val2, postfix[i]);
        push(&operands, result);
        i++;
    }
  }
  return pop(&operands);
}
```

OUTPUT:


tanis@Tanishq MINGW64 /d/COEP/DSA/LabWork/Stack Application
$ gcc -Wall main.c logic.c
tanis@Tanishq MINGW64 /d/COEP/DSA/LabWork/Stack Application
$ ./a
Enter a valid infix expression: 3 + 5 * 2
Postfix expression: 3 5 2 * +
Evaluated result: 13
tanis@Tanishq MINGW64 /d/COEP/DSA/LabWork/Stack Application
$ ./a
Enter a valid infix expression: ((2 + 3) * 4) - (5 / (2 + 3)) ^ 2
Postfix expression: 2 3 + 4 * 5 2 3 + / 2 ^ -
Evaluated result: 19