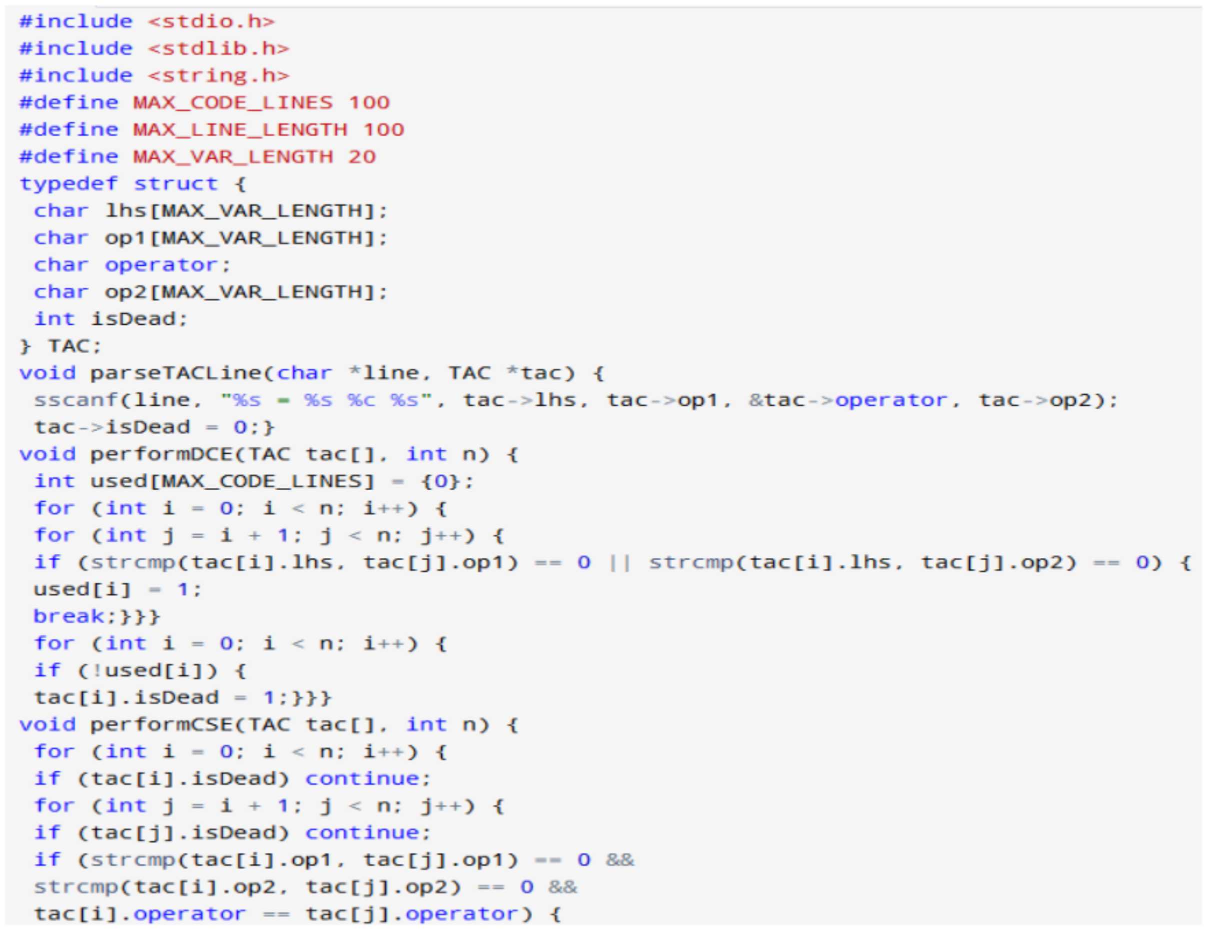
EX NO-11

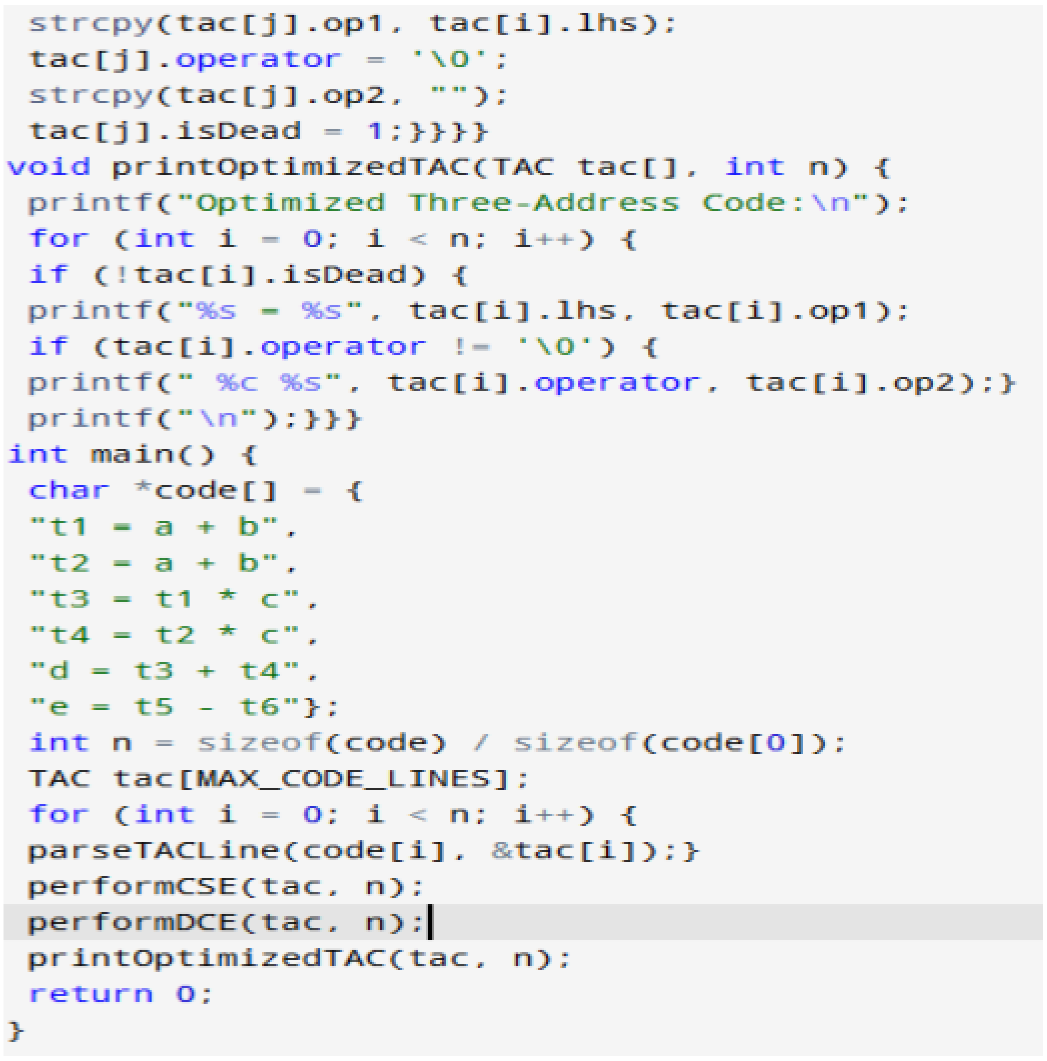
IMPLEMENT CODE OPTIMIZATION TECHNIQUES LIKE DEAD CODE AND COMMON EXPRESSION ELIMINATION

AIM: The aim is to implement code optimization techniques such as Dead Code Elimination (DCE) and Common Subexpression Elimination (CSE) on an intermediate representation of a program (such as Three-Address Code (TAC)). These optimization techniques help reduce the size of the code, improve runtime performance, and eliminate redundant computations during the compilation process.

PROGRAM

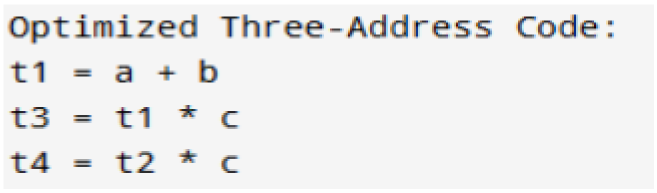


```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#define MAX_CODE_LINES 100
#define MAX_LINE_LENGTH 100
#define MAX_VAR_LENGTH 20
typedef struct {
 char lhs[MAX_VAR_LENGTH];
 char op1[MAX_VAR_LENGTH];
 char operator;
 char op2[MAX_VAR_LENGTH];
 int isDead;
} TAC;
void parseTACLine(char *line, TAC *tac) {
 sscanf(line, "%s = %s %c %s", tac->lhs, tac->op1, &tac->operator, tac->op2);
 tac->isDead = 0;}
void performDCE(TAC tac[], int n) {
 int used[MAX_CODE_LINES] = {0};
 for (int i = 0; i < n; i++) {
 for (int j = i + 1; j < n; j++) {
 if (strcmp(tac[i].lhs, tac[j].op1) == 0 || strcmp(tac[i].lhs, tac[j].op2) == 0) {
 used[i] = 1;
 break;}}}
 for (int i = 0; i < n; i++) {
 if (!used[i]) {
 tac[i].isDead = 1;}}}
void performCSE(TAC tac[], int n) {
 for (int i = 0; i < n; i++) {
 if (tac[i].isDead) continue;
 for (int j = i + 1; j < n; j++) {
 if (tac[j].isDead) continue;
 if (strcmp(tac[i].op1, tac[j].op1) == 0 &&
 strcmp(tac[i].op2, tac[j].op2) == 0 &&
 tac[i].operator == tac[j].operator) {
```



```
 strcpy(tac[j].op1, tac[i].lhs);
 tac[j].operator = '\0';
 strcpy(tac[j].op2, "");
 tac[j].isDead = 1;}}}}
void printOptimizedTAC(TAC tac[], int n) {
 printf("Optimized Three-Address Code:\n");
 for (int i = 0; i < n; i++) {
 if (!tac[i].isDead) {
 printf("%s = %s", tac[i].lhs, tac[i].op1);
 if (tac[i].operator != '\0') {
 printf(" %c %s", tac[i].operator, tac[i].op2);}
 printf("\n");}}}
int main() {
 char *code[] = {
 "t1 = a + b",
 "t2 = a + b",
 "t3 = t1 * c",
 "t4 = t2 * c",
 "d = t3 + t4",
 "e = t5 - t6"};
 int n = sizeof(code) / sizeof(code[0]);
 TAC tac[MAX_CODE_LINES];
 for (int i = 0; i < n; i++) {
 parseTACLine(code[i], &tac[i]);}
 performCSE(tac, n);
 performDCE(tac, n);
 printOptimizedTAC(tac, n);
 return 0;
}
```

OUTPUT



```
Optimized Three-Address Code:
t1 = a + b
t3 = t1 * c
t4 = t2 * c
```

RESULT: Thus the Above Program To Implement Code Optimization Techniques Like Dead Code and Common Expression Elimination Is Executed And Implemented Successfully.

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