Lab 11: MD5 Algorithm

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Course Name: Cryptography and Network Security Lab

Course Code: BCSE309P

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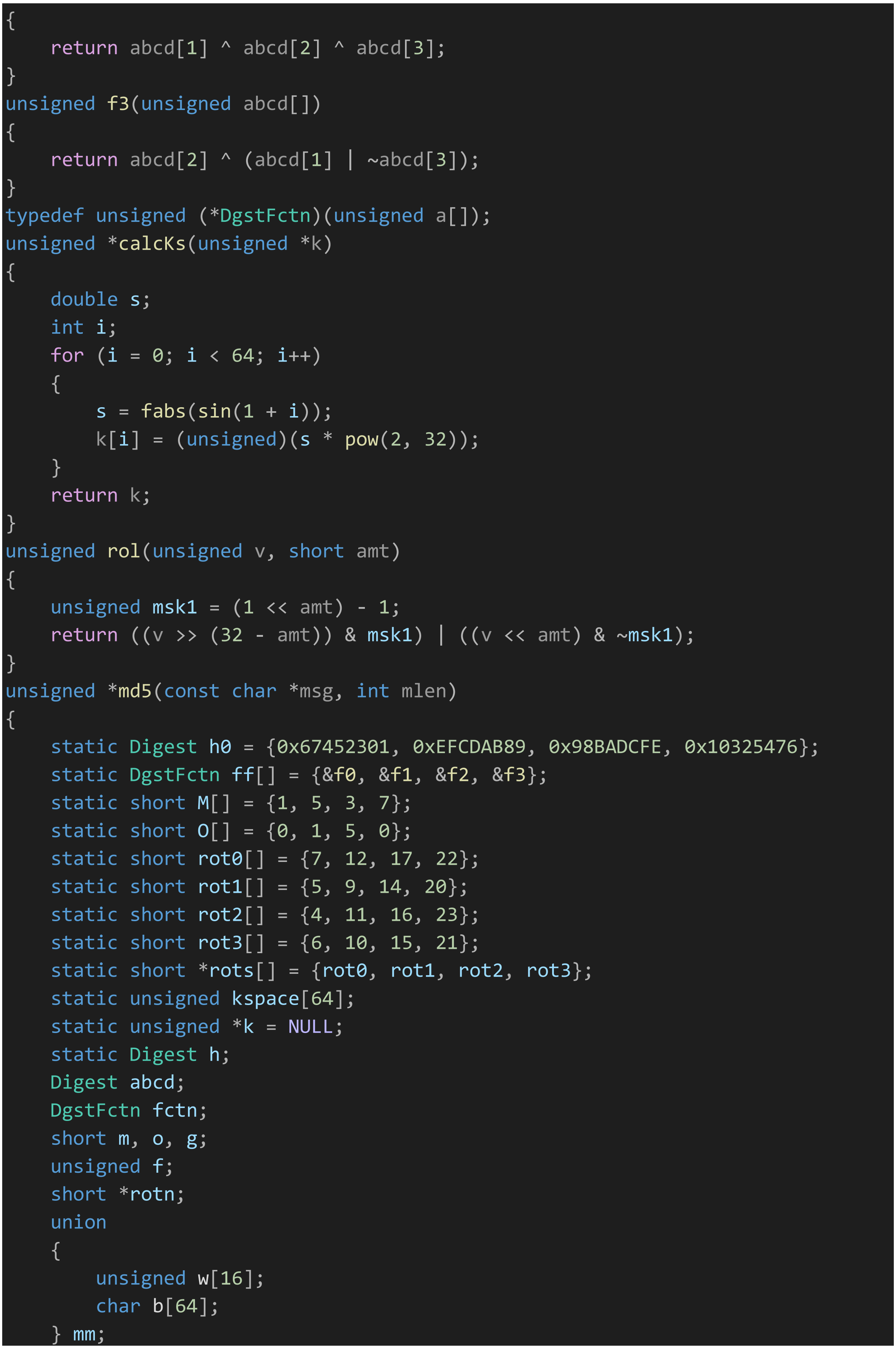
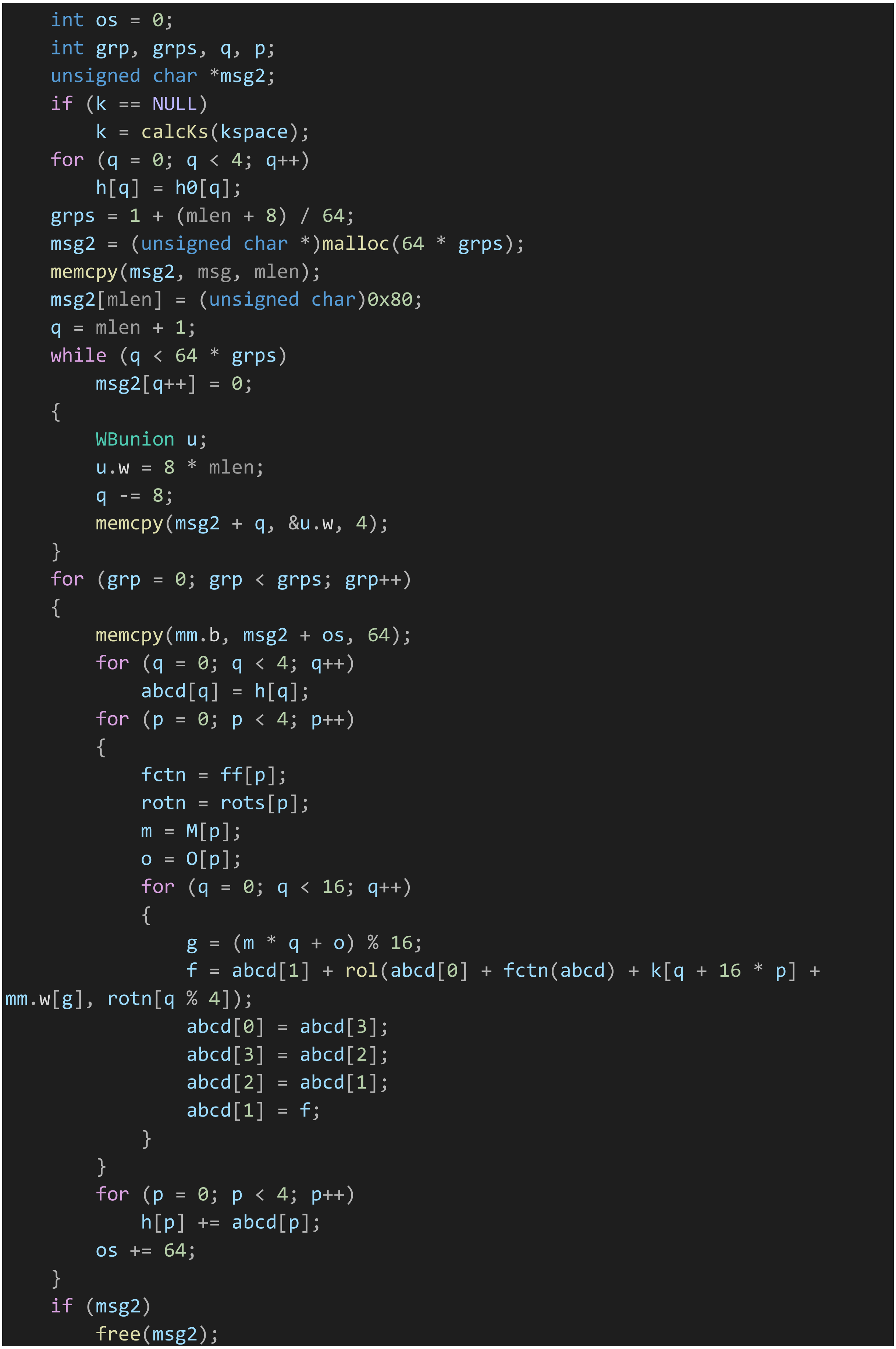
Code:

```
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <math.h>
typedef union uwb
{
    unsigned w;
    unsigned char b[4];
} WBunion;
typedef unsigned Digest[4];
unsigned f0(unsigned abcd[])
{
    return (abcd[1] & abcd[2]) | (~abcd[1] & abcd[3]);
}
unsigned f1(unsigned abcd[])
{
    return (abcd[3] & abcd[1]) | (~abcd[3] & abcd[2]);
}
unsigned f2(unsigned abcd[])
```

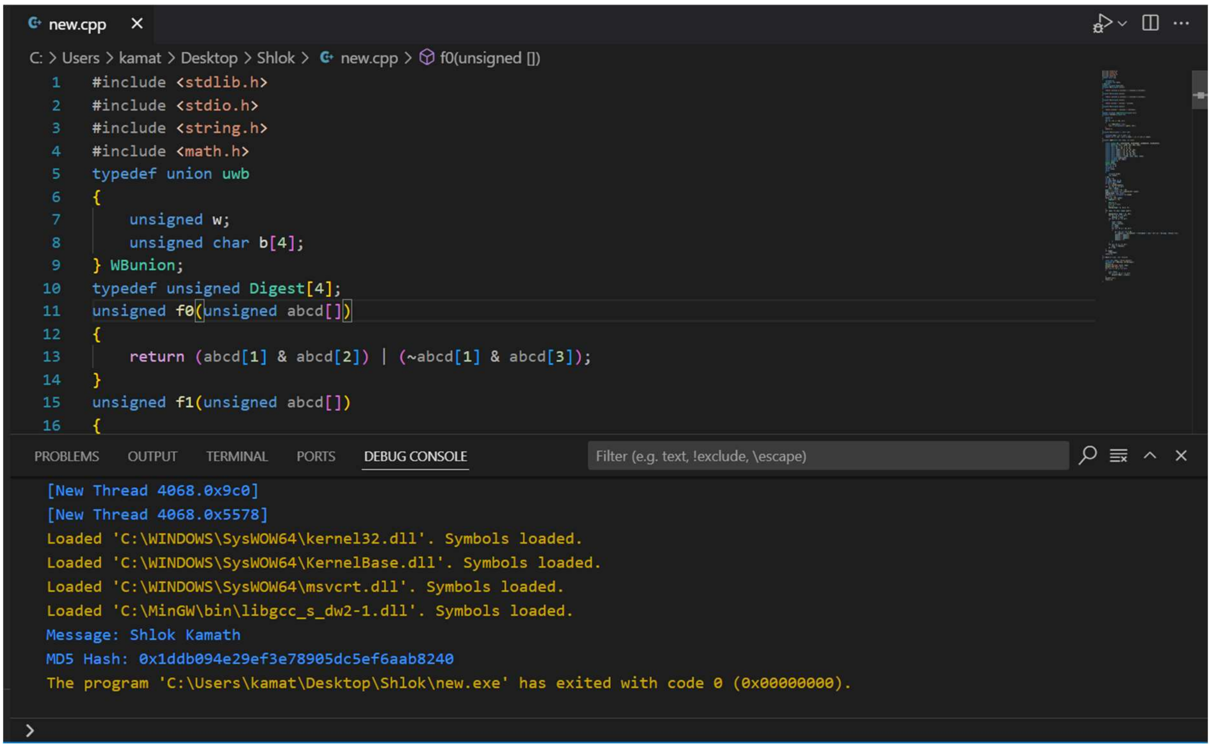


```
{
    return abcd[1] ^ abcd[2] ^ abcd[3];
}
unsigned f3(unsigned abcd[])
{
    return abcd[2] ^ (abcd[1] | ~abcd[3]);
}
typedef unsigned (*DgstFctn)(unsigned a[]);
unsigned *calcKs(unsigned *k)
{
    double s;
    int i;
    for (i = 0; i < 64; i++)
    {
        s = fabs(sin(1 + i));
        k[i] = (unsigned)(s * pow(2, 32));
    }
    return k;
}
unsigned rol(unsigned v, short amt)
{
    unsigned msk1 = (1 << amt) - 1;
    return ((v >> (32 - amt)) & msk1) | ((v << amt) & ~msk1);
}
unsigned *md5(const char *msg, int mlen)
{
    static Digest h0 = {0x67452301, 0xEFCDAB89, 0x98BADCFE, 0x10325476};
    static DgstFctn ff[] = {&f0, &f1, &f2, &f3};
    static short M[] = {1, 5, 3, 7};
    static short O[] = {0, 1, 5, 0};
    static short rot0[] = {7, 12, 17, 22};
    static short rot1[] = {5, 9, 14, 20};
    static short rot2[] = {4, 11, 16, 23};
    static short rot3[] = {6, 10, 15, 21};
    static short *rots[] = {rot0, rot1, rot2, rot3};
    static unsigned kspace[64];
    static unsigned *k = NULL;
    static Digest h;
    Digest abcd;
    DgstFctn fctn;
    short m, o, g;
    unsigned f;
    short *rotn;
    union
    {
        unsigned w[16];
        char b[64];
    } mm;
```



```
    int os = 0;
    int grp, grps, q, p;
    unsigned char *msg2;
    if (k == NULL)
        k = calcKs(kspace);
    for (q = 0; q < 4; q++)
        h[q] = h0[q];
    grps = 1 + (mlen + 8) / 64;
    msg2 = (unsigned char *)malloc(64 * grps);
    memcpy(msg2, msg, mlen);
    msg2[mlen] = (unsigned char)0x80;
    q = mlen + 1;
    while (q < 64 * grps)
        msg2[q++] = 0;
    {
        WBunion u;
        u.w = 8 * mlen;
        q -= 8;
        memcpy(msg2 + q, &u.w, 4);
    }
    for (grp = 0; grp < grps; grp++)
    {
        memcpy(mm.b, msg2 + os, 64);
        for (q = 0; q < 4; q++)
            abcd[q] = h[q];
        for (p = 0; p < 4; p++)
        {
            fctn = ff[p];
            rotn = rots[p];
            m = M[p];
            o = O[p];
            for (q = 0; q < 16; q++)
            {
                g = (m * q + o) % 16;
                f = abcd[1] + rol(abcd[0] + fctn(abcd) + k[q + 16 * p] +
mm.w[g], rotn[q % 4]);
                abcd[0] = abcd[3];
                abcd[3] = abcd[2];
                abcd[2] = abcd[1];
                abcd[1] = f;
            }
        }
        for (p = 0; p < 4; p++)
            h[p] += abcd[p];
        os += 64;
    }
    if (msg2)
        free(msg2);
    return h;
}
int main(int argc, char *argv[])
{
    const char *msg = "Shlok Kamath";
    unsigned *d = md5(msg, strlen(msg));
    WBunion u;
    printf("Message: %s\n", msg);
    printf("MD5 Hash: 0x");
    for (int j = 0; j < 4; j++)
    {
        u.w = d[j];
        for (int k = 0; k < 4; k++)
            printf("%02x", u.b[k]);
    }
    printf("\n");
    return 0;
}
```

Output:


new.cpp
C: > Users > kamat > Desktop > Shlok > new.cpp > f0(unsigned [])
PROBLEMS
OUTPUT
TERMINAL
PORTS
DEBUG CONSOLE
Filter (e.g. text, !exclude, \escape)

```
#include <stdlib.h>
#include <stdio.h>
#include <string.h>
#include <math.h>
typedef union uwb
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{
    return (abcd[1] & abcd[2]) | (~abcd[1] & abcd[3]);
}
unsigned f1(unsigned abcd[])
{
```

```
[New Thread 4068.0x9c0]
[New Thread 4068.0x5578]
Loaded 'C:\WINDOWS\SysWOW64\kernel32.dll'. Symbols loaded.
Loaded 'C:\WINDOWS\SysWOW64\KernelBase.dll'. Symbols loaded.
Loaded 'C:\WINDOWS\SysWOW64\msvcrt.dll'. Symbols loaded.
Loaded 'C:\MinGW\bin\libgcc_s_dw2-1.dll'. Symbols loaded.
Message: Shlok Kamath
MD5 Hash: 0x1ddb094e29ef3e78905dc5ef6aab8240
The program 'C:\Users\kamat\Desktop\Shlok\new.exe' has exited with code 0 (0x00000000).
```