BLG 413E

SYSTEM PROGRAMMING

CRN: 12300

PROJECT #1

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1. Introduction

A group of functions written in Intel assembly language are called from a program in C. The main program reads two matrices, A and B from two files each containing one matrix. Then in a simple menu loop, the user gives the choice to select the matrix operation. The result of each operation are shown on screen. The program ends when the user selects the quit option from the menu.

Following functions are implemented, selection parameters are in parentheses:

```
(a) void add(int *matrix1, int *matrix2, int *result, int size);
(s) int sum(int *matrix1, int size);
(m) void mult(int *matrix1, int *matrix2, int *result, int size);
(c) void scale(int *matrix1, int number, int *result, int size);
(u) void square(int *matrix1, int *result, int size);
(i) void ITU(int *matrix1, int size);
(q) quit option
```

2. Compilation and Running

The program can be compile, load and run by **compileAndRun.sh** script. Content of this script:

```
#!/bin/bash
rm -f *.o*                    #clear old object files
nasm -f elf32 add.asm
nasm -f elf32 sum.asm
nasm -f elf32 mult.asm
nasm -f elf32 scale.asm
nasm -f elf32 square.asm
nasm -f elf32 ITU.asm
gcc -c main.c -o main.o       #compile c file
gcc main.o add.o sum.o mult.o scale.o square.o ITU.o -o hw1.out #load
./hw1.out                     #run
```

In this script, all assembly files are converted to object files by NASM;

```
nasm -f elf32 add.asm
```

C source file is compiled without loading by GCC;

```
gcc -c main.c -o main.o
```

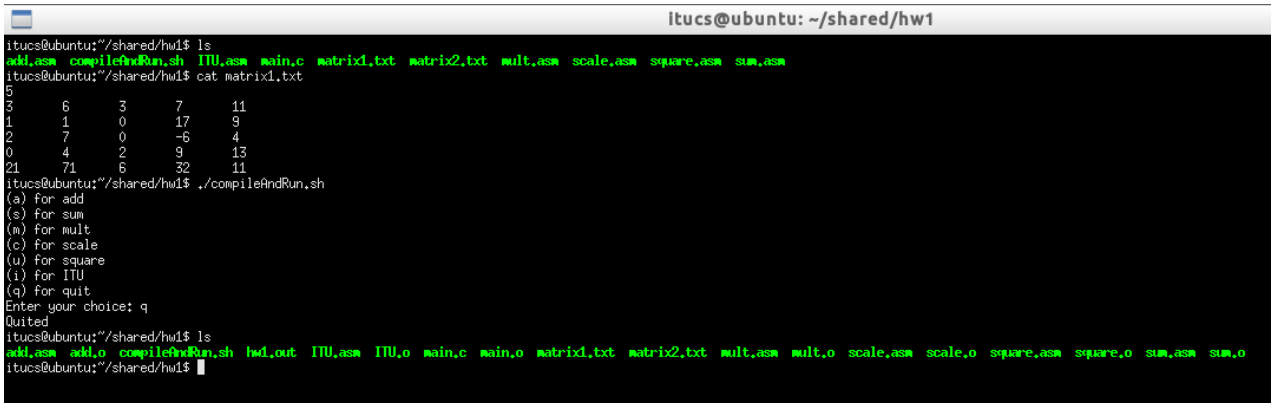
And all object files are loaded by GCC;

```
gcc main.o add.o sum.o mult.o scale.o square.o ITU.o -o hw1.out
```

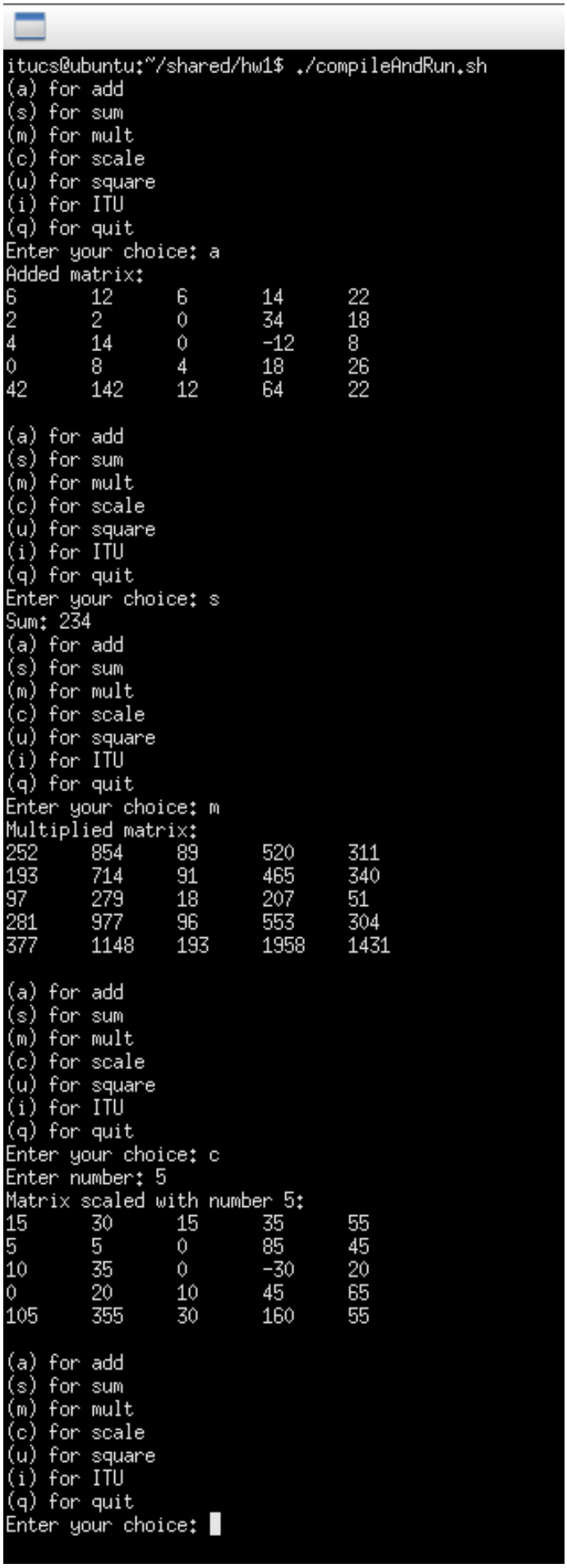
Finally elf32 executable file is executed;

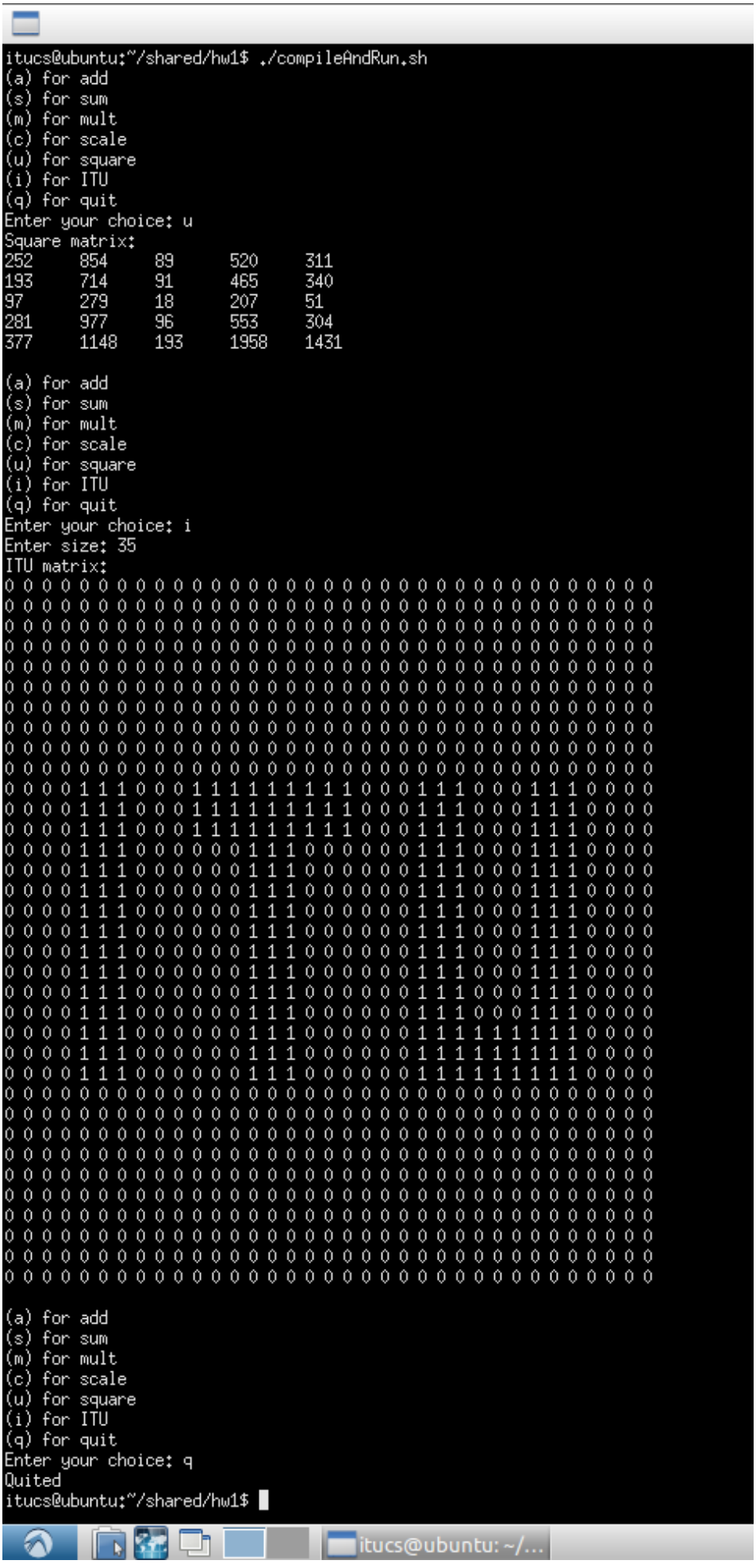
```
./hw1.out
```

Example compilation and loading process is below:



Example execution and outputs are below:


itucs@ubuntu:~/shared/hw1$ ./compileAndRun.sh
(a) for add
(s) for sum
(m) for mult
(c) for scale
(u) for square
(i) for ITU
(q) for quit
Enter your choice: a
Added matrix:
6 12 6 14 22
2 2 0 34 18
4 14 0 -12 8
0 8 4 18 26
42 142 12 64 22
(a) for add
(s) for sum
(m) for mult
(c) for scale
(u) for square
(i) for ITU
(q) for quit
Enter your choice: s
Sum: 234
(a) for add
(s) for sum
(m) for mult
(c) for scale
(u) for square
(i) for ITU
(q) for quit
Enter your choice: m
Multiplied matrix:
252 854 89 520 311
193 714 91 465 340
97 279 18 207 51
281 977 96 553 304
377 1148 193 1958 1431
(a) for add
(s) for sum
(m) for mult
(c) for scale
(u) for square
(i) for ITU
(q) for quit
Enter your choice: c
Enter number: 5
Matrix scaled with number 5:
15 30 15 35 55
5 5 0 85 45
10 35 0 -30 20
0 20 10 45 65
105 355 30 160 55
(a) for add
(s) for sum
(m) for mult
(c) for scale
(u) for square
(i) for ITU
(q) for quit
Enter your choice:


itucs@ubuntu:~/shared/hw1$ ./compileAndRun.sh
(a) for add
(s) for sum
(m) for mult
(c) for scale
(u) for square
(i) for ITU
(q) for quit
Enter your choice: u
Square matrix:
252 854 89 520 311
193 714 91 465 340
97 279 18 207 51
281 977 96 553 304
377 1148 193 1958 1431
(a) for add
(s) for sum
(m) for mult
(c) for scale
(u) for square
(i) for ITU
(q) for quit
Enter your choice: i
Enter size: 35
ITU matrix:
(a) for add
(s) for sum
(m) for mult
(c) for scale
(u) for square
(i) for ITU
(q) for quit
Enter your choice: q
Quited
itucs@ubuntu:~/shared/hw1$
itucs@ubuntu: ~/...