Homework 4

100 Points

Bit Manipulation

PROJECT: A variation of Project 3, page 181 // next page

Extra Credit – Write a program that finds the largest prime number less than a given number. Implement a variation of the Sieve of Eratosthenes's algorithm that uses bit manipulation.

Grading

1. Error checking (strtok, strtol) – 10
2. Use macros with arguments – 10
3. Solve all menu options (bit manipulation) – 80

   Sieve of Eratosthenes //Extra Credit

CIS 26B
Advanced C
Programming Assignments

A variation of Project 3, page 181

A theater stage has a set of computer controlled lights. There are 16 lights. A theater employee is working the lights, and you can assume that the on/off situation of the lights is entirely dependent on an unsigned short variable in your program. Your program which supplies the following menu:

0) turn off all lights
1) turn on all lights
2) turn on left stage lights (lights 11-15)
3) turn on center stage lights (lights 5-10)
4) turn on right stage lights (lights 0-4)
5) turn off left stage lights
6) turn off center stage lights
7) turn off right stage lights
8) overlay on/off pattern onto light configuration
9) quit the menu

Your program MUST:

1) Use the bit set/unset formulas as given in class.
2) Seek to reduce redundant code. You will find that some operations are related in this program and can therefore be combined to reduce code volume.
3) Use strtok to get user tokens. Assume whitespace (tabs or spaces) might surround any user response i.e. to the menu or a prompt which you supply.
4) Use strtol to convert strings (i.e. user responses to menu choices) to integers.
5) Perform complete user error-checking.
6) After each menu choice (except the "quit" choice), output the 32 bits representing on/off status to standard output.

Note: If the user chooses menu option 8, prompt him/her for a bit pattern and a starting bit from which to superimpose the bit pattern onto the current light configuration. For example, suppose the current light configuration is:

```
1111 1111 1111 1111
```

The user enters: 1001 3 in response to the prompt after he chooses menu item 8. The resulting configuration will be:

```
1111 1111 1100 1111   /* Thus 1001 is overlaid starting at bit 3 */
```

Menu choice 8 will require a different function than items 0-7. You must make sure that the given pattern is a valid bit string (use strtol() with base 2) and fits into the bit string given the starting location.