ENEE 150 – Midterm 1 Practice 2

Fall 2025 — Aman Garg

Name: _____
UID: _____
Instructions: Answer all questions. Show your work for number conversions. For coding, write neatly within the boxes. Partial credit will be awarded.

1. (12 points) **Number Systems with Edge Cases**
   Convert the following:
   (a) Decimal 1023 to binary and hex.

   (b) Binary 100000000 to decimal.

   (c) Octal 755 to binary and decimal.

   (d) Represent -37 in 8-bit two's complement. Then, convert your answer back to decimal to verify correctness. How about 37 in 8-bit two's complement?

2. (15 points) **Procedural Programming Review**
   Write a C program that reads n integers from the user (where n is provided by the user at runtime), computes their average, and prints the result. So the first prompt asks the users how many integers they will be entering, then you take in that many. Assume the user doesn't enter more or fewer.
   Do **not** use file I/O — just standard input/output.

   Function header:

   ```
   int main(void);
   ```

3. (25 points) **Functional Decomposition (Word Counter)**
You are asked to write a small program that counts the number of vowels in a word. Break the program into at least three functions:

   - `read_word()` – reads a word (string) from the user.
   - `count_vowels()` – returns the number of vowels in the word.
   - `print_result()` – prints the word and the number of vowels.

   Your `main()` should tie these together.

   Function headers:

```
void read_word(char *word, int max_len);
int count_vowels(const char *word);
void print_result(const char *word, int vowel_count);
```

4. (20 points) **Pointer Arithmetic Challenge**
   Write a function that counts how many times `substr` appears in `str` using pointers only.

   Function header:

   ```
   int count_substring(const char *str, const char *substr);
   ```

5. (15 points) **Testing and Unix Commands**
Answer the following questions about Unix commands and testing:

(a) What is the difference between `>`, `>>`, and `<` in shell command usage? Give a short example of each.

(b) Suppose you have written a program `myprog`. Write a command to run it with input from `input.txt` and send its output to `output.txt`.

(c) You want to compare `output.txt` against a reference file `golden.txt`. Write the command using `diff`. What does it mean if the command produces no output?

(d) Write commands to do the following:

i. Count the number of lines in a file `data.txt`.

ii. Print only the lines of `data.txt` that contain the word "error".

iii. List all files in the current directory with detailed information (permissions, owner, size).