Assignment 1 – C Programming

Question 1:

How many bytes do the following C types contain on your VM/machine:

- `unsigned char`
- `short`
- `unsigned long long`
- `long double`

[hint: we assume you will write code and run it on your VM]

Write down your answers below.

Question 2:

What is wrong with the following three C code fragments?

```
/*1*/ struct abc *ptr;
       printf(”%d\n”, ptr->field);


/*2*/ struct xyz *ptr = malloc(sizeof(ptr));


/*3*/ char *ptr = malloc(1000);
       memset(&ptr, 0, 1000);
```

For each code fragment, explain in 1—2 sentences.

Question 3:

Below is a piece of C code. Read it and answer questions:

```
void change(char *source)
{
    source[0] = 'a';
    printf("%s\n", source);
}
```

Code snippet A:

```
char *a = "ABC";
change(a);
```

Code snippet B:

```
char b[] = "ABC";
change(b);
```

Code snippet C:

```
char *c = (char *) malloc(6);
strncpy(c, "ABC", 6);
change(c);
```

Questions:

a) What are the outputs for code snippets A, B, and C, respectively?

[hints:

- these are valid C code. We encourage you to run them.
- you will need headers "string.h", "stdio.h", and "stdlib.h".]

Write down your results below.

b) Do code A, B, and C produce the same outputs? If not, explain why they get different outputs.

c) What lessons you learned from studying code A/B/C (all sending a "string" to the function)?

Write down what you learned in 1--2 sentences. (If you learned nothing, say "None".)

Question 4:

Write lines of code to do the following:

1. Define a struct (named "struct date") with three integer fields, named year, month and day.
2. Declare a local variable v1 of type "struct date"
3. Set the year, month, and day fields to 2022, 1, and 10 respectively
4. Declare a variable named v2 of type pointer to “struct date”
5. Use malloc to allocate the correct amount of memory for a “struct date” and assign it to v2
6. Set fields year, month, date in that structure to 2022, 1, and 10
7. free the allocated memory

[hints: You may find the following C tutorials useful:

- https://www.cprogramming.com/tutorial/c-tutorial.html and especially https://www.cprogramming.com/tutorial/c/lesson6.html
- https://web.archive.org/web/20060909064119/http://einstein.drexel.edu/courses/Comp_Phys/General/C_basics/
- Some instructors have recommended Learn C The Hard Way (https://learncodethehardway.org/c/) although it's a whole mini-course with video lectures etc. and is probably more than most students need.]

Write your code below.