**CS2106 Introduction to Operating Systems**

**Lab 1 - Leveling Up on C**

**Answer Book**

Please read the instructions in the main lab sheet before completing this document. Submission deadline is **Sunday 8 September 2024, 11.59 pm (2359 hrs)**.

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Section 1

**Question 1.1 (1 mark)**

It looks for the stdio.h file in the directory “/usr/include”.

**Question 1.2 (1 mark)**

It means the variables have internal linkage and are local to the current source file (i.e. they are inaccessible to other source files). They are stored in the data segment in memory.

**Question 1.3 (1 mark)**

Missing function declarations/prototypes for enq(double) and deq() in “queue.h”.

**Question 1.4 (1 mark)**

void enq(double);

double deq();Section 2

**Question 2.1 (1 mark)**

|  |  |  |
| --- | --- | --- |
| **Variable** | **Global / Local** | **Address** |
| p1 | G | 0x561f88008018 |
| p2 | G | 0x561f88008020 |
| p3 | G | 0x561f88008028 |
| p4 | G | 0x561f88008030 |
| w | L | 0x561f88008038 |
| x | L | 0x7fff9262182c |
| y | L | 0x7fff92621828 |
| z | L | 0x7fff92621834 |

**Question 2.2 (1 mark)**

|  |  |
| --- | --- |
| **Variable** | **Location (S, D, T or H)** |
| p1 | D |
| p2 | D |
| p3 | D |
| p4 | D |
| w | D |
| x | S |
| y | S |
| z | S |

How I inferred these answers from Q2.1:

Variables in the same location share the same range of addresses/front part of their addresses.

**Question 2.3 (1 mark)**

Static variables are created in the data segment of memory and hence their values are not stored in the stack frame of a function call on the call stack, which (the stack frame) will be cleared after the function exits.

**Question 2.4 (1 mark)**

A static local variable is only accessible within the function in which it was declared while a static global variable is accessible to any function within the source file it was declared in.

**Question 2.5 (1 mark)**

I added the ‘static’ keyword to the int variable acc. This causes the value in acc to be stored in the data segment of memory and hence be preserved across multiple function calls.

Section 3

**Question 3.1 (1 mark)**

The address of the memory allocated by malloc is from the heap while the addresses used by x, y and z are from the stack and the address used by p is from the data segment.

**Question 3.2 (1 mark)**

“free(node->name);” was added before “free(node);” in the freeNode function to ensure the memory allocated by malloc in the name variable of each TPerson is freed when freeNode is called towards the end of the program for each node created.

**Question 3.3 (1 mark)**

srun gcc -g llist.c testlist.c -o testlist

Section 4

**Question 4.1 (1 mark)**

If the new file name differs from the old file name, the hash function might yield a different index, depending on the characters in both file names. Hence, the renamed file might end up in the wrong hash table.

**Question 4.2 (1 mark)**

If (file with old name exists) {

add\_file(file with new name);

delete\_file(file with old name);

}

**TOTAL: \_\_\_\_\_\_\_\_\_\_\_ / 14**