

COMP 2510 Midterm Exam QUESTION BOOKLET
Winter 2024

This 90-minute exam has 5 questions. Scan the whole exam before starting. Budget your time wisely. You may NOT tear the pages apart.

It is a violation of the Honour Code to look at any exam other than your own, to look at any other reference material, or to otherwise give or receive unauthorized help. Violation of the Honour Code will result in ZERO.

You are free to use blank sheets attached at the end of the answer booklet as your work area. However, only answers in the answer box will be graded. If you make any assumption, make sure to write them in the answer box.

You will be expected to write C code on this exam. We recommend that you properly indent your code. Beyond that, you may use any C feature that you have learned about in class.

0. [2 points] Write last name, first name and A number at the top of each page (front and back) including unused pages and scratch paper in the answer booklet. Following all instructions on the cover page of the question booklet.

1. Multiple Choice Questions.

- i. [1 point] What will be the output of following code?

```
#include <stdio.h>
int main() {
    int i=30;
    char *ptr=(char *)&i;
    printf("%d", *ptr);
    return 0;
}
```

- A. 320
B. 64
C. 1
D. Compiler error
- ii. [1 point] The strings in C are represented by array of characters, consider a string “Hello World!”. What will be the last character stored in the array.
A. !
B. 0
C. NUL
D. None of these
- iii. [1 point] What is the maximum number of elements that can be stored in an array in C?
A. 1024
B. 4096
C. Unlimited
D. Depends on memory
- iv. [1 point] What will be the output if you compile and execute the following code?
#include <stdio.h>
void main() {
 int arr[]={0,0,3,8,9,7,6,8};
 printf("%d",arr[8]);
}
- A. 8
B. 0
C. NULL
D. Garbage value
- v. [1 point] What is the return value of the “malloc” function if it fails to allocate memory?
A. 0
B. -1

- C. 1
 - D. NULL
- vi. [1 point] Which function is used to allocate memory for an array of character strings in C?
- A. malloc
 - B. calloc
 - C. alloc
 - D. stralloc
- vii. [1 point] What happens if you attempt to free the same block of twice in C?
- A. The program terminates
 - B. It leads to undefined behavior
 - C. Memory is leaked
 - D. Memory is released, but pointer remains valid
- viii. [1 point] Which of the following can be a member of a structure in C?
- A. Function
 - B. Another structure
 - C. Enumeration
 - D. All of these
- ix. [1 point] What data structure is used to implement recursive function calls?
- A. Array
 - B. Queue
 - C. Stack
 - D. Linked List
- x. [1 point] Which of the following statement is true about recursion?
- A. Recursion is always better than iteration
 - B. Recursion use more memory compared to iteration
 - C. Recursion use less memory compared to iteration
 - D. Iteration is always better and simpler than recursion
- xi. [1 point] What is the primary difference between a structure and a union in C?
- A. Structure allows nested members
 - B. Union allows nested members
 - C. Structure allows multiple members
 - D. Union allows only one active member
- xii. [1 point] Can a structure have another structure as a member in C?
- A. No, It is not allowed
 - B. Yes, but with a limited depth
 - C. Yes, without any limitations
 - D. Only if the inner structure is named as "Inner"

- xiii. [1 point] How is the size of a structure determined in C?
- A. By the total size of its members
 - B. By the size of its largest member
 - C. By the size of its smallest member
 - D. By the number of members
- xiv. [1 point] What will be output if you compile and execute the following C code?
- ```
#include <stdio.h>
int main() {
 int x;
 for(x=1; x<=5; x++);
 printf("%d", x);
 return 0;
}
```
- A. 0
  - B. 5
  - C. 6
  - D. Compiler error
- xv. [1 point] What will be the output of following code?
- ```
#include <stdio.h>
int main() {
    char c=125;
    c=c+10;
    printf("%d", c);
    return 0;
}
```
- A. 135
 - B. 110
 - C. -121
 - D. Compiler error

2. [3 points] What is output of the following code?

```
#include<stdio.h>

int main(){
    int ***r, **q, *p, i=8;
    //int i is stored at address 0x100
    p = &i;
    q = &p;
    r = &q;
    printf("%d, %d, %d\n", *p, **q, ***r);
    return 0;
}
```

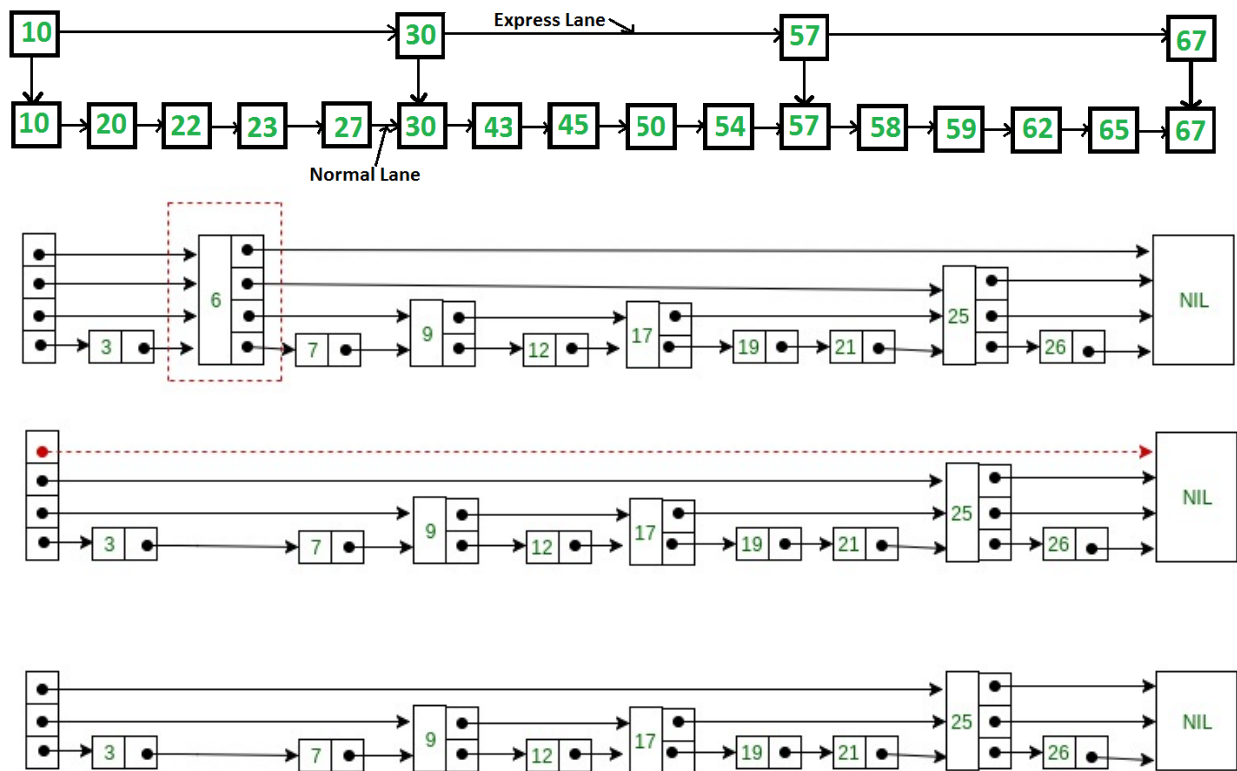
3. [3 points] What is output of the following code?

```
#include<stdio.h>

int main(){
    int i, a[] = {2, 4, 6, 8, 10};
    change(a, 5);
    for(i=0; i<=4; i++)
        printf("%d, ", a[i]);
    return 0;
}

void change(int *b, int n)
{
    int i;
    for(i=0; i<n; i++)
        *(b+1) = *(b+i)+5;
}
```

4. [9 points] Considered a sorted linked list, how can you search an item in it? There is no way to jump onto a linked list. A skip list is like a linked list with one or more express lanes to search an item in it. Can you search an item more efficiently by comparing it on the express lane? There can be more than one express lanes called skip list level. The height or level of the skip list is probabilistic. Write a C program to create a skip list and implement search operation. Consider the skip list initialization and helper functions are already defined. Your goal is to define a skip list using struct and to define a `skiplist_search` function.



END OF QUESTIONS